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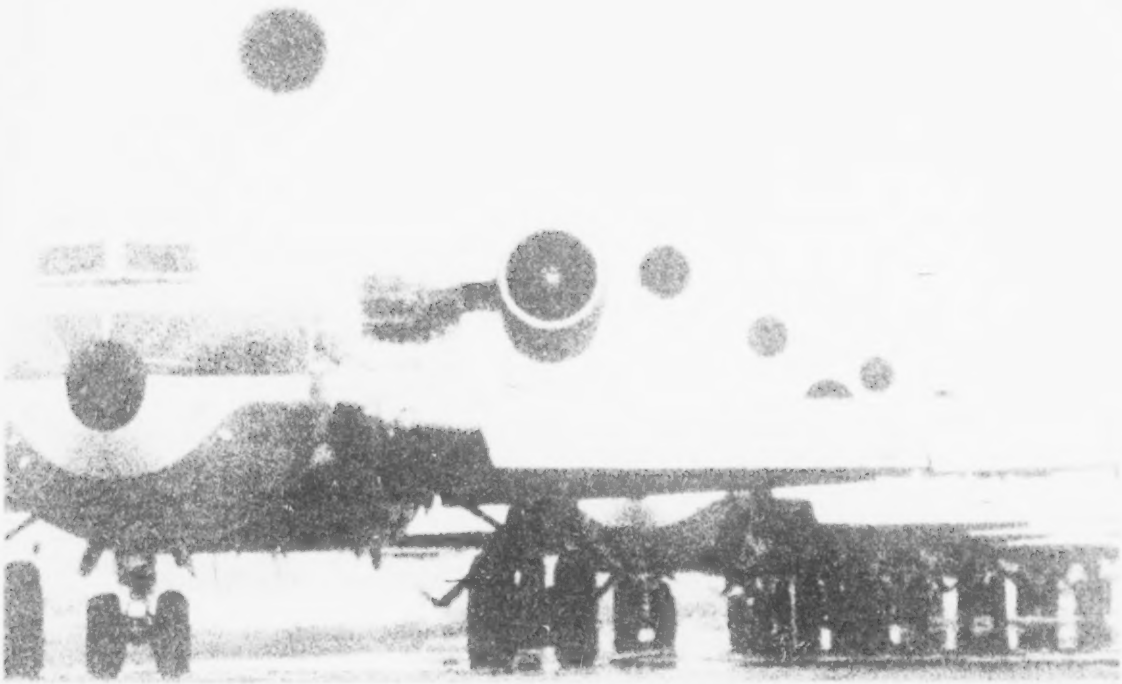
JULY 1988

Policies for the Deregulated Airline Industry



A SPECIAL STUDY

J932-23

POLICIES FOR THE DEREGULATED AIRLINE INDUSTRY

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PREFACE

Ten years ago the Congress passed the Airline Deregulation Act, ending government control over the routes airlines could serve and the prices they could charge. Deregulation has led to far-reaching changes in the industry. At the request of the Senate Governmental Affairs Committee, this study reviews these developments and discusses policies that the Congress might consider for improving the industry's performance. In keeping with the mandate of the Congressional Budget Office to provide objective analysis, it makes no policy recommendations.

Daniel P. Kaplan played a major role in the development of the project and wrote the report along with Mark R. Dayton. It was prepared in CBO's Natural Resources and Commerce Division under the supervision of Everett M. Ehrlich and Jenifer A. Wishart. Sandra Christensen, David Lindeman, and Linda Radey of CBO made helpful suggestions. Severin Borenstein, Alfred E. Kahn, and Daniel Kasper offered a number of valuable comments. The manuscript was edited by Francis S. Pierce. Margaret Cromartie typed the many drafts, and Nancy H. Brooks and Kathryn Quattrone prepared the report for publication. The cover photograph is from Federal Aviation Administration files.

James L. Blum
Acting Director

July 1988

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SUMMARY

The airline industry has seen sweeping changes in the 10 years since the Airline Deregulation Act was passed. Withdrawal of government control over the fares airlines can charge and the routes they can serve has led to lower fares and greater travel. It has also spurred the growth of hub-and-spoke route networks, which have made air service more convenient by offering an increasing amount of single-carrier service. Although competition among carriers serving a given market has, on average, increased, the largest firms in the industry now control an unprecedented share of the total traffic. This consolidation has raised some concern about the future performance of the industry.

Moreover, the infrastructure has not kept pace with the growth in air traffic. The resulting congestion threatens to offset much of the gain from deregulation, and the government has yet to develop a viable strategy to deal with the problem. Expanding the capacity of the aviation system would take years and would be expensive. A more promising solution might be to manage the existing capacity more efficiently.

COMPETITION

At the time the Congress passed the Airline Deregulation Act, most analysts believed that increasing an airline's size would not, above some relatively modest scale, substantially reduce its unit operating costs. Many also believed that when fares between two cities exceeded the costs of providing service, other carriers would be quick to enter the market. Entry and the threat of entry were expected to discipline carrier behavior in the absence of regulation.

While an airline's size may still not have much effect on its operating costs, large carriers may have certain advantages in attracting passengers to their flights. The ability to use the hub-and-spoke route systems, frequent flyer programs, and computer reservation sys-

tems--all of which depend on size to some degree--seems to have played an important role in the industry's consolidation. These same factors also appear to have made entry more difficult.

Advantages of Size

The Airline Deregulation Act removed government-imposed barriers that had prevented airlines from entering new markets. Not surprisingly, this encouraged entry by the formerly regulated carriers as well as by carriers that had not previously provided scheduled interstate air service. The largest carriers, the "trunks," initially bore the brunt of this new competition. New airlines, with substantially lower costs, competed on the basis of price. The "local service carriers," which had provided largely regional service under regulation, competed on the basis of service: they began flying to an increasing number of cities outside their traditional routes and were able to offer single-carrier service to an increasing number of destinations.

The trunks responded in a number of ways. They took steps to reduce labor expenses, the major source of their cost disadvantage. They developed sophisticated pricing systems that allowed measured responses to low-fare competition. They reconfigured their operations into hub-and-spoke route networks in order to provide more single-carrier service. They introduced frequent flyer programs to help create brand loyalty. Some of the larger carriers also aggressively marketed computer reservation systems; among other things, these enabled carriers to influence the recommendations of travel agents. These responses proved to be effective for a number of trunks, especially the largest ones. Such advantages of size were probably an important factor in the recent merger wave, although a number of smaller carriers continue to compete successfully.

Options to Increase Competition

Taken as a whole, the airline industry has performed competitively during the deregulated era. But the recent industry consolidation has raised questions whether, in an increasing number of markets, carriers may have acquired the power to raise fares above costs. While

there is little evidence that consolidation has adversely affected the industry's overall performance, the Congress might wish to consider a number of options that could increase competition by making entry easier. A return to fare regulation, however, would be likely to create more problems than it would solve.

Frequent Flyer Programs. A frequent flyer program is essentially a rebate made after the purchase of a certain amount of air service. The motivation is obvious: a passenger accumulating mileage on one carrier's frequent flyer program will be reluctant to use another carrier. Moreover, large carriers have an advantage in offering frequent flyer programs in that they serve more destinations, making it easier for travelers to earn and use their travel awards. One way to end the advantage provided by frequent flyer programs would be to abolish them. Since the awards are essentially rebates, abolishing them might raise the price of air transportation unless it stimulated market entry.

Alternatively, the government could tax the travel awards. Such a policy would be warranted by sound tax policy and might somewhat reduce the importance of the programs. Many people acquire frequent flyer awards while traveling on business. Since the employer pays for the travel, the awards should be considered part of employee compensation and taxed accordingly. Travel awards earned because of personal travel should not be taxed, however.

Booking Fees and Commissions. Travel agents make reservations for more than 70 percent of all air travel. Airlines have developed computer reservation systems (CRS) to assist agents in making reservations and issuing tickets. There are currently five systems, all owned by airlines, although two of them account for the bulk of the business. These systems have proved to be effective in determining which airlines agents recommend. Moreover, the CRS owners require carriers to pay a booking fee for each reservation that a travel agent makes on one of their flights. These fees are apparently well in excess of the cost of the service provided. CRS owners face little competitive pressure in setting these booking fees: since travel agents do not have to pay the booking fees, they do not consider them in deciding which system to select. If travel agents, rather than carriers, were required to pay the booking fees, CRS owners would have to compete with one another in establishing the fees. Depending on how commission rates responded,

such a rule could lower the costs of carriers that do not own computer reservation systems.

Airlines use an elaborate schedule of commissions to influence travel agent recommendations. Carriers that own computer reservation systems monitor the booking practices of agents and apparently use this information in determining agent compensation. In addition to a basic commission rate, most airlines pay their agents "commission overrides" when sales exceed some predetermined level. If differences in commissions paid to different agents had to be cost-justified, then the value of computer reservation systems would presumably be reduced. Even aside from the issue of the computer reservation systems, the commission overrides can adversely affect small carriers, which often have to pay the overrides on a greater percentage of travel agent sales than do larger carriers.

Foreign Carriers in Domestic Markets. Currently, foreign carriers are prohibited from carrying domestic passenger traffic in the United States. Foreign carriers would like to serve domestic markets as a way of supporting their international services, as hub-and-spoke route systems have become important on international as well as domestic routes. Such service would not only provide added competition for domestic carriers, but would be a means by which the United States could negotiate expanded route rights for U.S. airlines in foreign markets.

CONGESTION

The amount of air traffic the aviation system can handle depends on the runway and traffic control capacity at airports, and on the capacity of the airway system that guides aircraft flying between airports. Congestion results when there is more air traffic than airports or airways can accommodate at one time. The growth of congestion in recent years reflects the fact that investments in these systems have failed to keep up with the changes in the airline industry under deregulation. Not only has traffic increased substantially, but it has tended to be concentrated at airports where carriers have established hubs.

Current Management of the Aviation System

The Federal Aviation Administration (FAA) views the aviation system as a highway, open and available to all. Its response to increased demand is to try to increase the size of the system. But until new capacity becomes available, users of the system will continue to experience congestion and delays.

Aside from permitting delays, the government has used several other administrative methods to ration scarce capacity among users. One method is to establish a fixed number of landing and takeoff rights, or "slots," and to distribute these slots among potential users. In 1986, the government allowed carriers to buy and sell these landing rights at four airports where slots are currently used. Another method used to deal with congestion is to shift landing and takeoff schedules through agreements among the carriers. The government also publishes statistics showing airlines' on-time performance as a way of spurring them to adjust their schedules and operations so as to reduce the number of flights that are chronically late. The FAA has also developed reliever airports to reduce congestion at busy airport centers.

Continued use of such methods will do little to reduce congestion in the future. Takeoff and landing slots limit congestion, but increasing the number of airports in which they are used poses a serious threat to competition: a carrier may have difficulty in securing the necessary operating rights to mount a viable service. As the number of airports under slot restrictions increases, these problems magnify. Moreover, measures such as publishing on-time statistics and shifting schedules can do little to reduce the use of congested facilities.

Options for Reducing Congestion

Two broad options for reducing congestion are to expand the capacity of the aviation system and to manage existing capacity better.

Expanding Capacity. At present, the problems of congestion appear to be greatest with respect to airport runway and terminal facilities. The government could assist in the expansion of airport capacity by directing a larger share of its airport grants to large commercial air-

ports. Yet, this would probably have only a limited effect. Many congested airports do not have space to build the new runways necessary for increased operations. At others, noise and land-use concerns have limited major expansion for more than a decade. Moreover, additional airport facilities can only ease congestion at airports that have sufficient tower capacity. At a number of airports, additional tower capacity may not be available until the National Airspace System Plan nears completion in the mid-1990s.

Expanding capacity would also be relatively expensive. Since much of the capacity shortage is not chronic but merely occurs at peak travel times, investing in more infrastructure could result in substantial excess capacity at off-peak travel times.

Managing Capacity. Rather than attempting to build an aviation system that can handle all users, the Congress might consider the alternative of introducing more effective methods of managing existing capacity. Specifically, the FAA could be required to limit access to the system at any particular time to aircraft operators who value the access at more than the costs they impose by their use. Costs include not only the direct costs of using the aviation system, but also the congestion costs associated with operating an additional flight.

A national system of cost-based pricing could lead to efficient management of current capacity and provide proper signals for its expansion. At congested airports, peak-period charges could be collected in addition to current taxes. Alternatively, the current tax system could be replaced with an entirely new method of paying for use of the aviation system, in which prices would reflect both the costs of providing aviation system services for a particular flight and the overall costs of congestion. Regardless of which method was used, the charges could cover the costs of operating the aviation system and also the costs of delay that an additional flight imposes on air travelers. Both methods would help to substitute existing capacity for new capacity by shifting the flights of those not willing to pay higher fees during peak periods to other times or other airports.

The second approach--replacing the existing system of financing the aviation system with a new system--is probably the better option. The use of peak surcharges would carry forward the distortions caused

by the subsidies that are part of the current aviation tax system. Although setting the initial prices for air traffic control services might be difficult, once they were set they would be relatively easy to adjust. When demand exceeded capacity at a given time, the price would be raised. At times of excess capacity, the price would be dropped. Since service to small communities might be adversely affected by such a pricing system, some special provision could be made for flights to such communities.

CHAPTER I

AN OVERVIEW OF AIRLINE DEREGULATION

The Congress deregulated the airline industry in order to secure lower air fares. While deregulation has achieved this goal, it has also brought a number of less widely anticipated developments. Concentration in the industry has increased: the largest airlines now have a greater share of the traffic than they did when the industry was regulated. The fare structure has become increasingly complex: passengers within a given market, and indeed on the same flight, pay widely different fares. Most important, perhaps, carriers have dramatically changed their route systems: hub-and-spoke networks have not only increased service convenience but have increased competition as well.

The combination of fare reductions and route realignments, however, has strained the capacity of the aviation system. The increase in air travel resulting from deregulation has placed additional burdens on airports as well as on an air traffic control system that was already rapidly becoming obsolete. While the public has gained from improved service and lower fares, these gains are threatened by increased congestion. Convenient service, and in fact the competitiveness of the industry, depend critically on the efficient operation of the aviation system.

THE REGULATION AND DEREGULATION OF THE AIRLINE INDUSTRY

The Congress established the Civil Aeronautics Board (CAB) in 1938 and gave it the authority to determine the carriers that could provide interstate service, the routes they served, and the prices they charged.1/ The CAB established two principal classes of airlines. The largest carriers, or "trunks," concentrated on serving routes between major metropolitan areas. The Congress had recognized their route

1. Originally the CAB also had responsibility for regulating safety. In 1958, the Congress established the Federal Aviation Administration, which assumed these responsibilities.

authority when it established the board.2/ In addition, the CAB created "local service carriers" after World War II to provide regional service to smaller cities.

Profitability was the critical factor in determining fare levels. Differences in fares among markets were based almost exclusively on distance, although distance is not the only determinant of costs. (For example, it usually costs less to transport a passenger in heavily traveled markets or in vacation markets than on otherwise similar routes.)3/ In addition, the CAB deliberately set fares in short-haul markets below costs, and fares in long-haul markets above costs.

These differences between regulated fares and the costs of service represented, in part, an attempt by the CAB to make passengers in dense long-haul markets subsidize those in thinner short-haul markets. In practice, the cross-subsidy never worked very well, because the CAB could not restrict nonprice competition. It did, however, permit more than one carrier to serve many dense markets, so carriers frequently competed in such things as service amenities and the number of flights they offered.4/ Since schedule competition invariably lowered the percentage of seats that were filled, it increased costs. In effect, instead of setting prices equal to costs, CAB regulation set costs equal to fares.

Academic critics began questioning the need for economic regulation of the airline industry in the 1960s. It was not until the mid-1970s, however, that the Congress seriously considered changing the regulatory regime. A number of factors motivated a Congressional inquiry. Most notably, for a number of years, fares in markets served by intrastate carriers in California and Texas had been significantly lower than in otherwise similar interstate markets. Only carriers providing interstate service were subject to CAB regulation. Moreover,

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2. Before it established the Civil Aeronautics Board, first the Post Office and then the Interstate Commerce Commission had regulated the industry. For a brief history of the pre-CAB period, see Michael Levine, "Is Regulation Necessary? California Air Transportation and National Regulatory Policy," *Yale Law Journal* (July 1965), pp. 1416-1447.

3. For further discussion of these issues, see Elizabeth Bailey, David Graham, and Daniel Kaplan, *Deregulating the Airlines* (Cambridge, Mass.: MIT Press, 1985), pp. 48-60.

4. Under regulation, it was generally believed in the industry that if a carrier increased the percentage of flights it offered in a market, its share of passengers would increase more than proportionately.

the CAB consistently turned down applications of new low-fare carriers to enter the industry.

While the Congress was investigating the effects of airline regulation, Presidents Ford and Carter appointed CAB members who were committed to a more flexible regulatory regime. Beginning in 1977, the CAB progressively increased the carriers' latitude to reduce fares. These regulatory initiatives provided vivid evidence that CAB policies had indeed been yielding unnecessarily high fares. Largely as a result, real air fares fell by more than 8 percent in 1978 and traffic increased by almost 17 percent.5/

The Congress passed the Airline Deregulation Act in October 1978 that gradually phased out the CAB's authority over routes and rates. The CAB itself was to cease operations on January 1, 1985, two years after its authority to regulate fares ended. The Department of Transportation assumed the CAB's responsibilities in areas such as international aviation, antitrust, and consumer protection.6/

In addition to removing government barriers to entry, the Airline Deregulation Act also removed government barriers to exit: the CAB had prevented carriers from suspending service on many unprofitable small routes. The act did, however, guarantee that the government would subsidize service to communities that would have been left without scheduled air service. Although this guarantee of air service was to expire in 1988, the Congress has continued to subsidize service to such communities. None of the provisions of the Airline Deregulation act applied to the regulation of safety, which remained the province of the Federal Aviation Administration.

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5. Air fares are measured in cents per mile. Air traffic is measured in revenue passenger miles; a revenue passenger mile is one paying passenger flying one mile.

6. The Airline Deregulation Act did not apply to international services that are governed by agreements of the United States with foreign governments. The Sunset Act, passed shortly before the CAB closed, changed some of the Airline Deregulation Act's provisions for distributing the CAB's responsibilities among other agencies.

THE EFFECTS OF DEREGULATION

Deregulation took place gradually; the process began in 1977 when the CAB gave carriers greater flexibility to reduce fares. Although its regulatory authority did not formally expire until January 1983, the CAB effectively gave carriers the authority to determine the routes they served and the prices they charged more than two years earlier.

There can be little question that deregulation has delivered on its promise of creating a more efficient industry. Labor productivity has increased at an average annual rate of 3.8 percent since 1978, compared with 2.3 percent between 1970 and 1978 (see Figure 1).7/ Similarly, air traffic has grown faster and air fares have fallen more rapidly than they did while the industry was regulated (see Figures 2 and 3). Deregulation has also produced an industry that is fundamentally different from that created by the CAB during 40 years of regulation.

The Boom (1977-1979)

In early 1977, the CAB approved requests by Texas International and American Airlines to introduce restricted discount fares. This reversed a policy that the CAB had adopted only a few years earlier. Most notably, American Airlines proposed to offer fares up to 45 percent below its unrestricted coach fare for travel between New York and San Francisco or Los Angeles. To be eligible for the discount fares, passengers had to purchase their tickets 30 days before departure and could not return from their destinations for at least 7 days. In response to these discounts, traffic on the routes increased dramatically and the CAB approved similar fares for other transcontinental markets. Gradually the CAB allowed carriers to introduce equivalent discounts in an increasing number of markets, and by the spring of 1978 these "Super Saver" fares were available in virtually all markets. Moreover, over time carriers reduced both the minimum stay and the advance purchase requirements attached to these fares.

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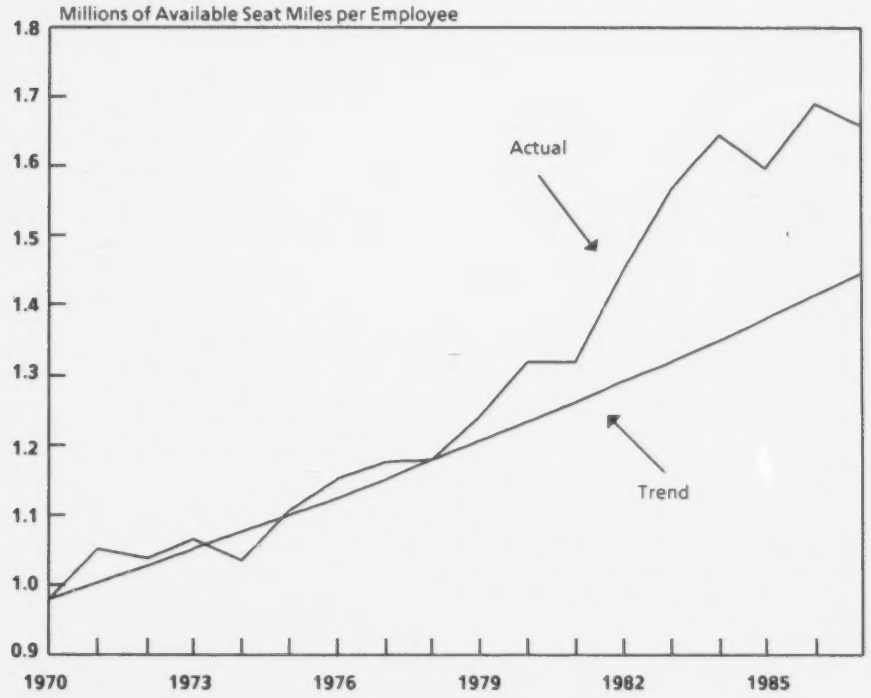
7. Labor productivity is defined as available seat miles per full-time employee; for a given flight the number of available seat miles is equal to the number of seats on the aircraft times the distance of the flight.

Figure 1.
Labor Productivity
Actual vs. Trend Under Regulation



SOURCE: Congressional Budget Office, from Department of Transportation data and CBO estimates.

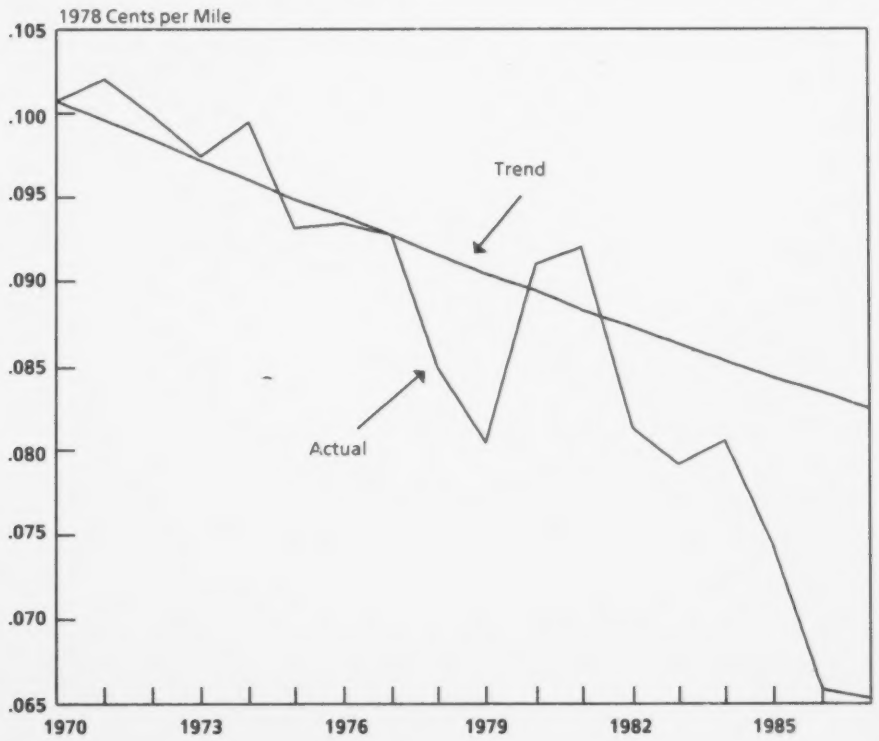
NOTE: Includes both domestic and international operations. In computing the trend, labor productivity is assumed to have grown after 1978 at the same rate it had grown between 1970 and 1978. Employment data are for December. Part-time employees are counted as one-half full-time workers.

Discount fares were not new to the aviation industry.8/ Super Saver fares differed, however, from the myriad of previous discounts

8. It costs an airline very little to accommodate a passenger in an otherwise empty seat. Most of the costs of operating a flight--for the airplane, the crew, and the required maintenance--are not affected by the number of passengers aboard. Even the amount of fuel consumed is hardly affected. Advance purchase and minimum stay requirements assure that business travelers will not be able to take advantage of these low fares. Thus, fares like the Super Saver are profitable if they merely stimulate sufficient travel among price-sensitive passengers.

in two significant respects. In the first place, the fares were more restrictive and the discounts larger than their predecessors. In addition, on popular flights, carriers often offered narrower discounts and made fewer seats available. In effect, they used these restricted discount fares as a form of peak/off-peak pricing.

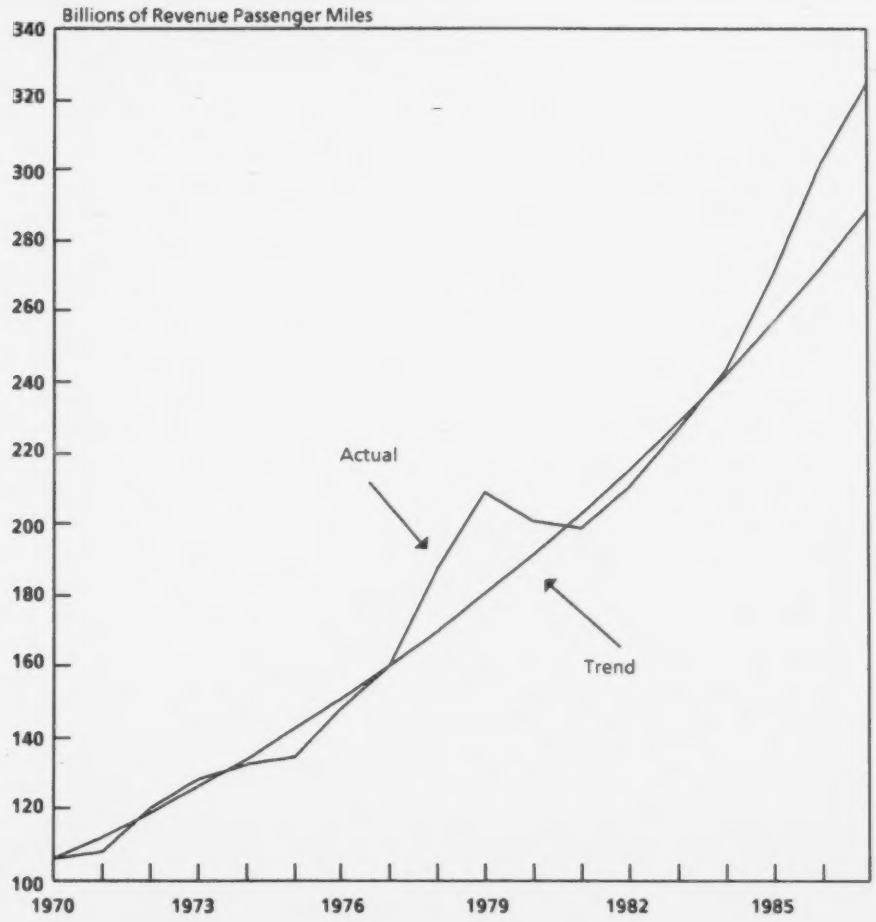
Figure 2.
Domestic Air Fares
Actual vs. Trend Under Regulation



SOURCE: Congressional Budget Office, from Department of Transportation data.

NOTE: In computing the trend, the average fare per mile is assumed to have declined after 1977 at the same rate as it had declined between 1970 and 1977.

Figure 3.
Air Traffic of Scheduled Domestic Carriers
Actual vs. Trend Under Regulation



SOURCE: Congressional Budget Office, from Department of Transportation data, annual reports, and CBO estimates.

NOTE: In computing the trend, traffic is assumed to have grown after 1977 at the same rate as it had grown between 1970 and 1977.

Much of the traffic stimulated by the discount fares filled seats that would otherwise have been empty. For that reason, although average fares declined, industry profits increased. The Congress and

many observers saw this as a clear indication of the merits of deregulation, paving the way for passage of the Airline Deregulation Act in the fall of 1978.

The good times did not last very long. Airlines are a fuel-intensive industry, and demand for airline services is quite sensitive to economic growth. In 1979, events in the Middle East led to a doubling of fuel prices; with their costs increasing rapidly, airlines increased fares. In 1980, the economy entered a recession, followed by yet another recession in 1981. The combination of higher fares and negative economic growth led to declining airline traffic in both 1980 and 1981. The industry had not experienced negative traffic growth in two successive years since World War II.

Proliferation (1980-1985)

Fare liberalization was not entirely new; the CAB had loosened the regulation of fares in previous periods. A more significant break with the past was the dismantling of government barriers to entry, both for new carriers seeking to enter the industry and for existing carriers seeking to enter new routes. The Airline Deregulation Act permitted the CAB to disapprove a carrier's application for new route authority only if an incumbent carrier could demonstrate that entry by a competitor would not be consistent with public convenience and necessity. Since this was a difficult standard for incumbents to meet, the CAB awarded carriers the authority to serve virtually any domestic route within 60 days of their application.9/ This provision also paved the way for new carriers to enter the industry. (The era of free entry had a brief hiatus beginning in 1981, when the FAA had to restrict airline operations after a strike led to the firing of three-quarters of the nation's air traffic controllers.)

New Entrants. Shortly after the Congress enacted the Airline Deregulation Act, intrastate carriers like Southwest and PSA, along with charter carriers like Capitol and World, quickly began interstate service. They were followed by entirely new carriers such as Midway,

9. Previously the burden of proof had been on the entrant. Beginning in 1979, virtually the only cases in which the CAB did not confer the requested route authority were those involving environmental problems at an airport--most notably, community concerns about noise.

People Express, and America West Airlines. For the most part these carriers had significantly lower costs than the regulated carriers. Their cost advantage stemmed in part from the fewer service amenities they offered--such as less space between seats and minimal food service. More important, they did not inherit the high wage rates and restrictive work rules of the formerly regulated carriers. Regulation had produced relatively high labor costs because it tended to inhibit price cuts reflecting the lower operating costs of new generations of aircraft. With the introduction of jets during the 1960s, these cost savings had been substantial, and airline employees had managed to capture a significant share of them.10/

The lower costs of the new entrants enabled them to undercut prevailing fares by significant amounts. As passengers gladly accepted reduced service amenities in return for lower fares, the formerly regulated carriers were forced to match the prices of their new competitors.

Local-Service Carriers. Increased competition also came with the entry of formerly regulated carriers into new routes. Under regulation, the local-service carriers had become significant regional operators of jet equipment, but the CAB had largely restricted each of these carriers to serving a specific geographic region. With deregulation, they began flights to many new markets outside of their historic regions and proved to be formidable competitors. Their new services were especially attractive to passengers who had to make connections en route to their destinations.

Fewer than 5 percent of the 50,000 city-pairs between which people in the United States fly receive nonstop service. The other markets simply do not have enough traffic to support nonstop flights in efficient-sized jet aircraft. When passengers change planes, they generally prefer not to change airlines. They believe that staying on the same airline reduces the probability of missing a connecting flight

10. See, for example, Bailey, Graham, and Kaplan, *Deregulating the Airlines*, pp. 95-102. For evidence of the effect of regulation on labor compensation in another industry, see Nancy Rose, "Labor Rent Sharing and Regulation: Evidence from the Trucking Industry," *Journal of Political Economy* (November/December 1987), pp. 1146-1178.

or losing baggage. Single-carrier service also increases convenience by helping to avoid long walks between terminals at an airport.11/

Under regulation, most passengers from a small or medium-sized community flew on a local-service carrier to a nearby major city, where they often had to switch to a trunk airline. With the introduction of service to more major cities, the local-service carriers could offer single-carrier service to an increasing number of these passengers. To maximize the connecting possibilities, these carriers would schedule flights from various cities to arrive at a hub airport at about the same time. After an interval for passengers and their baggage to change planes, the flights would proceed to their ultimate destinations. With this hub-and-spoke route system, a carrier could serve many more city-pair markets than if it only offered one-stop flights.12/

Trunks. The trunks initially bore the brunt of the competitive pressures from local-service carriers and new entrants. Before the Airline Deregulation Act, the trunks had controlled nearly 90 percent of domestic air traffic. By 1985 that share had fallen to 72 percent, and two of the trunk carriers--Braniff in 1982 and Continental in 1983--had gone bankrupt.13/ On the other hand, more than 20 new carriers had begun interstate service with jet equipment by 1985.

The new entrants offered lower fares than the trunks, and the local-service carriers offered more convenient service. The trunks responded by renegotiating labor contracts in order to reduce their costs. They also reconfigured their routes into hub-and-spoke networks that allowed them to deploy their aircraft more effectively. The trunks also developed frequent flyer programs as a way of building brand loyalty among business travelers. Several of them also aggressively marketed computer reservation systems that encouraged travel agents to recommend their flights. Yet, among the trunks only the largest were truly profitable.

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11. Consequently, online connecting service is more valuable to passengers. See Dennis Carlton, William Landes, and Richard Posner, "Benefits and Costs of Airline Mergers: A Case Study," *Bell Journal of Economics* (Spring 1980), pp. 11/65-11.83.

12. For a fuller discussion of this topic, see Chapter II.

13. Continental used its bankruptcy to abrogate its labor contracts. It resumed operation after a weekend by rehiring many of its employees at lower wages and with more flexible work rules. Braniff resumed operation in 1984 with a different management and different employees.

Consolidation (1985-1987)

The survival rate of the new entrants was not very good. Only one of the four former intrastate carriers, and only a handful of the newly formed carriers, were still operating independently in 1988 (see Table 1).14/ Several of them were acquired by other carriers. Some would probably not have continued to operate if they had not been acquired.

Problems of the New Entrants. The previously noted responses of the incumbents to the increased competition were an important reason that so many new entrants exited the industry. Changes in the pricing strategies of the incumbents were also important. At first they simply matched the new entrants' fares, but this did not prove to be an effective strategy. When both the incumbent and new entrant charged the same price, most passengers opted for the brand-name carrier. Often, however, the incumbent could not cover its costs at the reduced fare. Moreover, if the incumbent did not increase its capacity, the lower fares could stimulate enough traffic to fill the flights of both the incumbent and the entrant; then, despite the losses incurred by the incumbent, the new entrant would still be profitable.

Over time, the former trunks found less costly ways of responding to the new entrants.15/ Instead of cutting fares across the board, they reduced only those restricted discount fares used by the most price-sensitive passengers. They also limited the number of seats they would make available at the reduced fares. In some cases, these discounted fares undercut the prices of the new entrants. Thus, restricted discount fares, which had heralded the start of the deregulation process, became an effective weapon against competition from low-cost carriers. The incumbents also tailored their capacity, scheduling flights to depart near the entrants' scheduled departure times and assuring that they had sufficient capacity to accommodate the traffic stimulated by the lower fares.

14. Presidential Airline, which started service in 1985, now operates under the name of United Express and largely provides feeder service for United Airlines. There are also a number of commuter carriers that began jet service under deregulation.

15. For a fuller discussion of these issues, see Michael Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy and Public Policy," *Yale Journal on Regulation* (Spring 1987), pp. 472-478.

TABLE 1. NEW ENTRANTS INTO INTERSTATE SERVICE
(Selected carriers)

Carrier	Year Entered	Year Exited	Reasons for Exiting
		Former Intrastates	
Air California	1979	1987	Acquired by American
Air Florida	1979	1984	Failed
Pacific Southwest	1979	1987	Acquired by USAir
Southwest	1979	Still operating	
		Former Charter Carriers	
Capitol	1979	1984	Failed
World	1979	1986	Ceased scheduled passenger service
		New Carriers	
Air Atlanta	1984	1987	Failed
Air One	1983	1984	Failed
American International	1982	1984	Failed
America West	1983	Still operating	
Braniff (new)	1984	Still operating	
Florida Express	1984	1988	Acquired by Braniff
Hawaii Express	1982	1983	Failed
Jet America	1981	1987	Acquired by Alaska Air
Midway	1979	Still operating	
Muse	1981	1985	Acquired by Southwest
Northeastern	1983	1985	Failed
Pacific East	1982	1984	Failed
Pacific Express	1982	1984	Failed
People Express	1981	1986	Acquired by Texas Air
Presidential	1985	Still operating	
Regent Air	1985	1986	Failed

SOURCE: Congressional Budget Office, from Department of Transportation data.

NOTE: Some of the acquired carriers continue to operate under their own names.

The discount fares had advantages besides meeting low-cost competition. Effective management of the size of the discounts, as well as flight-by-flight management of the number of seats made available at each fare, enabled carriers to fill a high proportion of their seats while assuring time-sensitive passengers a high probability of getting seats on their preferred flights. The resulting increases in load factors were important in reducing average costs.

Hub-and-spoke route networks also proved to be an effective deterrent to entry by low-cost carriers. Many passengers must make intermediate stops en route to their ultimate destinations. And conversely, on all but the densest routes, carriers must carry significant amounts of connecting traffic. As a result, with a relatively few exceptions, carriers must operate their flights as part of a hub-and-spoke route network. Thus it became quite difficult for a new carrier to enter the industry by serving a few markets and then gradually expanding.16/ The start-up costs for a new carrier proved to be greater than many of the advocates of deregulation expected.

Not all of the formerly regulated carriers managed to adapt easily to the new environment. The smaller of the trunks were the most adversely affected. Two of them went bankrupt and several others significantly contracted their domestic operations. Although the local-service carriers as a group performed well, those that hubbed at the same airports as a trunk carrier generally did less well.

At the start of deregulation, smaller carriers had the flexibility and low costs that enabled them to respond quickly to market opportunities. There now seems reason to believe that the larger carriers have a number of significant advantages in competing in the deregulated industry (see Chapter II). However, several new entrants--most notably America West, Midway, and Southwest--seem to have established viable niches in the industry.

Mergers. Changing perceptions as to the advantage of size may have been an important factor in the wave of mergers over the past several years (see Table 2). In addition, some in the airline industry apparently believed that the Department of Transportation would be more

16. See Elizabeth Bailey and Jeffrey Williams, "Sources for Economic Rent in the Deregulated Airline Industry," *The Journal of Law and Economics* (April 1988), pp. 173-202.

TABLE 2. MERGERS AND ACQUISITIONS INVOLVING FORMERLY REGULATED CARRIERS

Year	Carriers
1979	North Central and Southern (name changed to Republic) Pan Am and National
1980	Republic and Hughes Air West
1981	Texas International and Continental
1985	People Express and Frontier
1986	Delta and Western Texas Air and Eastern (Texas Air also owns Continental) Texas Air and People Express Northwest and Republic TWA and Ozark Alaska and Jet America
1987	USAir and Pacific Southwest American and Air California USAir and Piedmont

SOURCES: Congressional Budget Office; Federal Trade Commission, *The Deregulated Airline Industry* (January 1988).

sympathetic to merger proposals than the Civil Aeronautics Board had been.17/ Since the department's authority over mergers began in 1985 and is scheduled to lapse in 1989, carriers may have seen this as a relatively narrow window of opportunity. Following the merger wave and the exit of most of the new entrants, the industry has become more concentrated than it had been under regulation (see Table 3). Moreover, the share of traffic controlled by the largest one or two carriers has increased at most airports.

Yet, few of the mergers raised significant competitive issues. In fact, the average number of carriers providing service in a single market has increased significantly since 1978.18/ While there has

17. See testimony of Julius Maldutis before the Senate Committee on Commerce, Science, and Transportation, November 4, 1987. Mr. Maldutis is a vice president at Salomon Brothers, Inc., an investment banking firm.

18. For information on the changes in the number of carriers between 1978 and 1983, see Civil Aeronautics Board, *Implementation of the Provisions of the Airline Deregulation Act of 1978* (January 31, 1984), p. 14. For subsequent information, see Table 4 of this report.

TABLE 3. STRUCTURE OF THE DOMESTIC AIRLINE INDUSTRY
(In percentages of revenue passenger miles)

1978		1983		1987	
Carrier	Percent of Revenue Passenger Miles	Carrier	Percent of Revenue Passenger Miles	Carrier	Percent of Revenue Passenger Miles
1. United	21.1	1. United	18.7	1. Texas Air	20.3
2. American	13.5	2. American	13.8	Continental 10.2	
3. Delta	12.0	3. Eastern	11.1	Eastern 10.1	
4. Eastern	11.1	4. Delta	11.1	2. United	17.3
5. TWA	9.4	5. TWA	7.1	3. American	15.4
6. Western	5.0	6. Republic	4.2	4. Delta	13.0
7. Continental	4.5	7. Northwest	4.2	5. USAir	8.9
8. Braniff	3.8	8. Western	3.9	USAir 4.0	
9. National	3.6	9. Continental	3.5	Piedmont 3.5	
10. Northwest	2.6	10. Pan Am	3.3	PSA 1.4	
11. USAir	2.2	11. Southwest	1.7	6. Northwest	7.9
12. Frontier	2.0	12. Frontier	1.7	7. TWA	6.4
				8. Southwest	2.5
				9. America West	1.8
				10. Pan Am	1.6
				11. Braniff (New)	1.0
				12. Alaska	0.9
Top Four	57.7	Top Four	54.7	Top Four	66.0
Top Eight	80.4	Top Eight	74.1	Top Eight	91.7
Top Twelve	90.8	Top Twelve	84.3	Top Twelve	97.0

SOURCE: Congressional Budget Office, from Department of Transportation data and annual reports.

NOTE: Northwest was on strike for part of 1978. Data for 1987 reflect mergers of American with Air California and USAir with Piedmont and PSA, even though operations were not affected for the entire year.

been a substantial increase in industry concentration since 1983, there has not been a corresponding increase in concentration at the market level. On average, the effective number of carriers serving markets of more than 200 miles with 25 or more passengers a day has even increased slightly.19/ It has grown from 2.4 carriers in 1983 to

19. A common way to measure market concentration is with the Herfindahl Index. It is computed by squaring each firm's market share and summing over all the firms. The index ranges from virtually zero--when each firm has a very small share--to one when there is a monopoly. The reciprocal of the Herfindahl is the number of equal-sized competitors that would produce the same amount of competition that is observed in the market. For example, if one firm has a share of 0.5, two firms have shares of 0.2 each, and a fourth a share of 0.1, the Herfindahl Index is 0.25 + 0.04 + 0.04 + 0.01 = 0.34. The reciprocal of this number (1 divided by 0.34) is approximately 3, meaning that three firms with equal shares would produce the same index of competition. In computing the effective number of firms, this paper used the weighted average of the reciprocals of the Herfindahls.

2.5 carriers in 1987.20/ This is true not only in the densest markets, but in markets of varying densities and distances (see Table 4). 21/

Only if one considers passengers using single-plane service--that is, excluding connecting service--has the effective number of carriers declined. From 1983, it fell by 3 percent to 1.9 carriers in 1987. On average, longer-haul markets have experienced an increase in the number of carriers providing single-plane service, while shorter-haul markets have experienced a slight decrease.

THE SAFETY ISSUE

Deregulation did not apply to government safety rules. The Federal Aviation Administration has continued to monitor airline maintenance personnel and procedures, as well as flight crew qualifications. Nevertheless, some critics have charged that before deregulation the airlines provided more safety than the FAA required whereas now they provide only the amount mandated by the government.22/ Despite declines in both the number of accidents and the accident rate, concern over the impact of deregulation on airline safety persists.

One of the major goals of deregulation was to increase competition. Without fare and route regulation, carriers have no protection from lower-cost competitors, and thus deregulation has increased the importance of maintaining low costs. One way for airlines to reduce costs, of course, would be to reduce the amount of maintenance they perform on their aircraft. They could also employ less qualified, and therefore presumably lower-paid, pilots and maintenance personnel.

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20. A number of mergers were consummated after the first quarter of 1987. The data have been adjusted to reflect American's acquisition of Air California, Alaska's acquisition of Jet America, and USAir's acquisition of both Piedmont and PSA.

21. Moreover, a carrier on one route may compete with a carrier serving another route. For example, depending on the relative fares, a passenger may decide to vacation in Florida or in California. Carriers on short-haul routes must also compete with surface transportation, most notably by car.

22. See, for example, J. Glen Moore, "Aviation Safety: Maintaining Safety in a Deregulated Environment," Congressional Research Service, May 12, 1988.

TABLE 4. EFFECTIVE NUMBERS OF FIRMS SERVING CITY-PAIR MARKETS (Weighted Averages by Year, Distance, and Passenger Density)

Year (First quarter)	Miles Between Cities 200-500	501-1,000	1,001-1,500	1,501-2,000	Over 2,001
25-50 Passengers per Day					
1983	1.24	1.57	1.93	2.37	1.82
1987	1.57	1.93	2.25	2.71	2.53
1987[a]	1.45	1.88	2.23	2.70	2.52
51-200 Passengers per Day					
1983	1.43	1.89	2.22	2.27	2.17
1987	1.44	2.09	2.61	2.91	2.84
1987[a]	1.36	2.04	2.56	2.90	2.84
201-500 Passengers per Day					
1983	1.50	2.25	2.46	2.30	2.46
1987	1.65	2.11	2.55	2.75	2.94
1987[a]	1.61	2.06	2.52	2.72	2.94
501-1,000 Passengers per Day					
1983	1.90	2.25	2.43	2.45	2.88
1987	1.96	2.30	2.38	2.18	3.82
1987[a]	1.90	2.28	2.37	2.18	3.82
Over 1,000 Passengers per Day					
1983	2.33	2.80	2.67	2.83	3.85
1987	2.28	2.92	2.45	2.83	4.13
1987[a]	2.22	2.92	2.45	2.83	4.13
All Densities					
1983	1.81	2.15	2.43	2.42	2.72
1987	1.86	2.26	2.48	2.69	3.27
1987[a]	1.80	2.23	2.46	2.67	3.27
Average for All Markets					
1983	2.40				
1987	2.52				
1987[a]	2.49				

SOURCE: Congressional Budget Office, from the Department of Transportation's Origin and Destination Survey.

NOTE: Includes all direct and one-stop flights. Companies that control more than one carrier are considered to be one airline. The effective number of firms is the reciprocal of the Herfindahl Index of the relevant market weighted by revenue passenger miles. (The Herfindahl Index is computed by squaring each firm's market share and summing for all firms.)

a. Reflects mergers that were consummated after the first quarter of 1987.

But carriers have a compelling reason to maintain their aircraft properly even without government regulation: passengers are reluctant to travel on unsafe airlines. If a carrier experienced a rash of accidents, passengers would avoid its flights and--since aircraft maintenance expenses represent less than 10 percent of airline operating expenditures--the resulting fall in revenues would quickly overwhelm any cost savings from reduced maintenance.23/

The Congress regulates safety in order to make certain that carriers devote sufficient resources to maintaining their aircraft. It is possible that the airlines chose to perform more maintenance than the government required during regulation, but do not do so now, although there is no support for this in the accident statistics. In fact, the number of fatal accidents per departure declined more than 50 percent between the last eight years of the regulated era (1970-1978) and the first eight years of the deregulated era (1979-1987).24/

THE OUTLOOK UNDER DEREGULATION

Airline deregulation has led to a more efficient industry, providing lower-priced transportation to the vast majority of air travelers. This is precisely why the Congress deregulated the industry. Deregulation has also produced another dividend that may be even more important: improved service convenience. The hub-and-spoke system has made connections much easier in the vast majority of markets that cannot support nonstop service. The hub-and-spoke networks also provide

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23. This might not be true of a carrier that was close to bankruptcy. In that case, the savings from reduced maintenance could help stave off failure. One study found some indication of a negative relationship between profit margins and the incidence of accidents among smaller operators of jet aircraft. The study included data from both the regulated and deregulated eras. There is no evidence that such carriers are more likely to have higher accident rates with deregulation than they had under regulation. See Nancy Rose, "Financial Indicators and Airline Accident Performance: An Economic Assessment," MIT School of Management, November 1987.

24. See Aviation Safety Commission, *Final Report and Recommendations* (April 1988). For a more extensive discussion of accident statistics, see John Ogur, Curtis Wagner, and Michael Vita, *The Deregulated Airline Industry: A Review of the Evidence*, Federal Trade Commission (January 1988), pp. 61-74. For reports of statistical analyses that failed to find an adverse effect on safety caused by deregulation, see Richard McKenzie and William Shugart, "Deregulation and Air Travel Safety," *Regulation*, no. 3/4 (1987), pp. 42-47; and Steven Morrison and Clifford Winston, "Air Safety, Deregulation, and Public Policy," *The Brookings Review* (Winter 1988), pp. 10-15.

increased competition from connecting airlines in markets that are receiving nonstop service. Single-carrier connections are especially important to passengers in smaller cities, since they reduce travel times for those who must change planes en route to their destinations. One study concluded that in 1983 the time savings from the realigned route network were probably worth more to consumers than the savings from lower fares. It further estimated the total benefits of deregulation at roughly $6 billion in that year.25/

Yet, not everyone has benefited. The CAB deliberately kept fares below costs in short-haul and low-density markets; not surprisingly, prices on these routes have increased. Moreover, there is evidence that, other things being equal, the less competition in a city-pair market the higher the fares. There is also a wide variation in fares offered to different passengers traveling on the same flight. In fact, one study concluded that unrestricted coach fares, which accounted for only 10 percent of industry traffic in 1986, are much higher than they would have been had CAB-style regulation continued.26/ There is no evidence, however, that firms in the industry have earned profits in excess of a competitive level. During regulation, airline profitability, as measured by the return to stockholders' equity, was lower than in manufacturing. Moreover, operating profit margins, which provide an indication of how the airline industry's profitability has varied over time, have declined since deregulation (see Figure 4).

Although the vast majority of air travelers have benefited from airline deregulation, there are lingering concerns as to whether these gains will be permanent. Specifically, the unexpected reduction in the number of carriers has raised questions as to how aggressively the airlines will compete with each other in the future.

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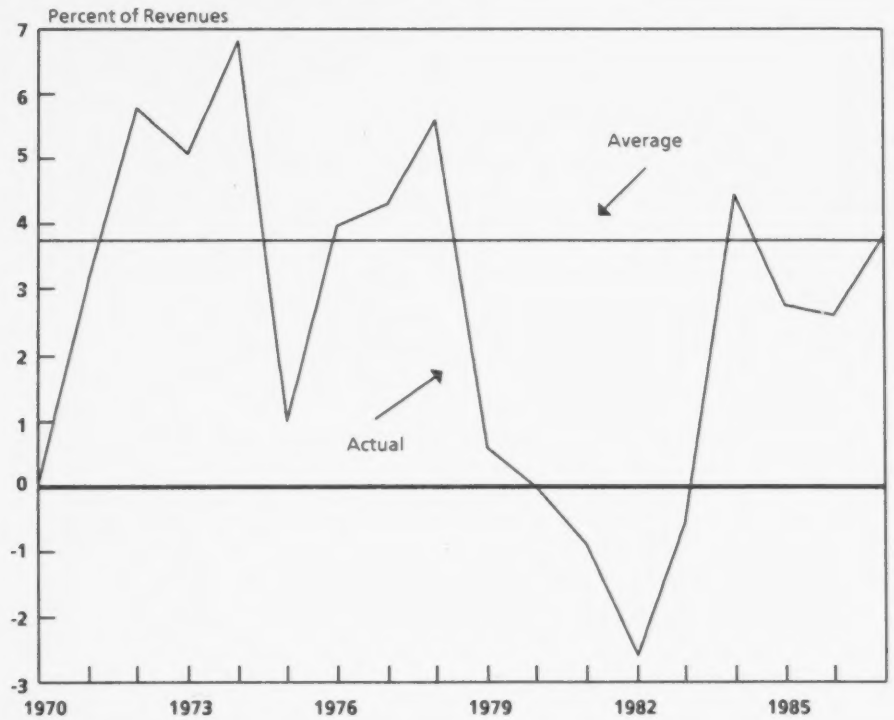
25. See Steven Morrison and Clifford Winston, *The Economic Effects of Airline Deregulation* (Washington, D.C.: Brookings, 1986), pp. 24-36.

26. It is, however, costly to provide convenient service to time-sensitive passengers. See Don Pickerell and Richard Horn, "Airline Fare Restructuring Since Deregulation," unpublished manuscript, Transportation System Center, Department of Transportation. Another study found that coach fares in 1984 had not increased more rapidly than they would have increased under regulation. See John Meyer and Clinton Oster, *Deregulation and the Future of Intercity Passenger Travel* (Cambridge, Mass.: MIT Press, 1987), pp. 112 and 113.

Some consolidation in the industry was probably inevitable. And government policies designed to spur competition may have little impact on industry concentration. The future performance of the industry may depend more on how effectively the government manages air traffic than on any conceivable reduction in industry concentration. Deregulation brought a rapid increase in traffic, and the sudden emergence of hub-and-spoke systems has tended to concen-

Figure 4.
Operating Profit Margins on Domestic Operations
Actual vs. Average Under Regulation



SOURCE: Congressional Budget Office, from Department of Transportation data.

NOTE: Intrastate carriers not included prior to 1979.

The average under regulation is the average operating profit margin between 1970 and 1977.

trate traffic peaks at particular airports and at particular times of the day. The result has been a substantial increase in traffic delays and a resort to ad hoc methods of dealing with congestion. Unless the government does a better job of managing its provision of air traffic services, a significant part of the gains of deregulation may be lost.

CHAPTER II

THE INDUSTRY'S CONSOLIDATION

Before deregulation, most analysts thought that the economies of scale in the industry were relatively modest.1/ They believed that--for the trunk airlines, and for at least the largest local service carriers--an increase in size would not significantly reduce the unit costs of providing service. That being so, small carriers could profitably compete with larger carriers. But while an airline's size may not have much effect on the cost of operating aircraft, size may be important in helping it to fill the aircraft with passengers. Securing advantages of size was apparently one factor behind the recent merger wave.

ADVANTAGES OF SIZE

The average cost of providing air service depends critically on the percentage of seats on a flight that are filled. Most analyses of economies of size, however, essentially assume that the size of an airline has little effect on its ability to fill seats.2/ With deregulation, the airlines developed new ways of doing business: hub-and-spoke route systems, frequent flyer programs, and computer reservation systems became important parts of the competitive landscape. These innovations have significantly influenced the ability of carriers to affect demand for their services. And large carriers have been able to use them most effectively.3/

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1. See, for example, Alfred Kahn, "Surprises of Airline Deregulation," *American Economic Review* (May 1988), pp. 316-322.

2. See Douglas Caves, Laurits Christiansen, and Michael Tretheway, "Economies of Density versus Economies of Scale: Why Trunk and Local Service Airline Costs Differ," *The RAND Journal of Economics* (Winter 1984), pp. 471-490. Their study includes data from both the regulated and deregulated eras.

3. To an important extent these factors affect the economies of scope of providing airline service; because of them the cost of serving a given market is reduced if a carrier adds service in other markets. For a discussion of the role that these and other factors have had in shaping the deregulated airline industry, see Michael Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy and Public Policy," *Yale Journal on Regulation* (Spring 1987), pp. 393-494.

Hub-and-Spoke Route Systems

Because of the importance of connecting traffic, as well as passengers' strong preference for single-carrier service, airlines have had to adopt hub-and-spoke route systems in order to be viable competitors. At an airline hub, as many as 40 flights may arrive within a relatively short period of time. After exchanging passengers and transferring baggage, the aircraft proceed to their ultimate destinations.

A carrier's size is important in operating an efficient hub-and-spoke network. Increasing the number of flights has a geometric impact on the number of city-pairs a carrier serves through its hub. Consider a carrier operating a hub where 10 aircraft arrive en route to 10 other cities. A passenger on any arriving flight can continue on to any of those cities. A passenger on a flight from San Francisco, for example, can proceed to Washington, Philadelphia, New York, or seven other cities on the east coast. Similarly, passengers traveling from other west-coast cities can make connections to the same 10 east-coast cities. Ten flights operating through a hub, therefore, can offer connecting or one-stop service in 100 city-pair markets, plus nonstop service in 20 city-pair markets. If the carrier adds 10 additional flights with an intermediate stop at the carrier's hub, the number of connecting or one-stop city-pairs served increases to 400: passengers on flights from each of 20 origins can choose among 20 destinations. Thus doubling the number of flights quadruples the number of city-pairs served through the hub. With an increase in the number of possible destinations, the number of passengers per flight increases as well. This, in turn, reduces unit costs, because it allows the carrier to use larger air-craft and fill a higher percentage of its seats.

The number of flights offered in each city-pair also affects the viability of a carrier's hub. Up to some critical number of flights, carriers with the most service in a market tend to get a disproportionately large share of the traffic. There is direct evidence of this phenomenon in nonstop markets, and it presumably applies to connecting service as well.4/ Passengers reasonably expect carriers with

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4. See Elizabeth Bailey, David Graham, and Daniel Kaplan, *Deregulating the Airlines* (Cambridge, Mass: MIT Press, 1985), pp. 166-171. For a discussion of other factors that encourage passengers to book passage on carriers offering a wide selection of flights in a market, see Michael Levine, "Airline Competition in Deregulated Markets," pp.443-444.

the most flights in a market to be the most likely to have a flight at or near a desired departure time, and tend to contact those carriers first. Moreover, most fares require passengers to book both legs of a round-trip flight on the same carrier. This not only provides further incentive for passengers to contact the leading carrier, but also provides travel agents with an incentive to recommend the flights of that carrier.5/

A carrier has to be fairly large in order to operate a hub at a major airport, because it must offer relatively frequent service in a large number of cities.6/ There are only a handful of airports where more than one carrier operates a hub, and there are currently none where more than two carriers do so.7/

At smaller cities, a carrier can operate a hub with fewer flights. But to be successful, a carrier must offer connecting passengers relatively frequent service. Most connecting passengers can choose among a variety of airports at which to make their intermediate stops. Although carriers at different hubs do not operate nonstop flights in competition with one another, they nevertheless offer connecting service in many of the same markets. An Oklahoma City passenger traveling to Washington, D.C., for example, can connect at Atlanta, Dallas, Memphis, and several other airports.

An airline may be able to lower its unit costs by operating more than one hub--in other words, having a second hub at a different airport may reduce a carrier's cost of operating the first hub. There are two reasons for this. First, a carrier can serve many of the same cities from both hubs. Piedmont, for example, offers flights from Boston to its hubs at both Baltimore and Charlotte. Certain fixed costs--such as maintaining a station and advertising--are associated with serving

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5. A travel agent must find an acceptable time for both the outbound and return flights. If a carrier for the outbound flight does not offer a convenient return, the agent has to recommend another outbound carrier. Recommending the carrier with the most flights increases the probability of quickly finding convenient flights for both segments.

6. See, for example, Michael Levine, "Airline Competition in Deregulated Markets," pp. 444-445. Also see Elizabeth Bailey and Jeffrey Williams, "Sources of Economic Rent in the Deregulated Airline Industry," *Journal of Law and Economics* (April 1988), pp. 173-202.

7. See Table 5 on page 35 of this report for the relevant data in 1985. While three carriers operated hubs at Denver in 1985, only two operate hubs there now. Frontier, which ran into financial difficulties, was acquired by People Express, which was then acquired by Continental.

any city. By operating a second hub, a carrier may be able to increase operations at the "spoke" cities that it is already serving without a proportionate increase in costs. Operating an additional hub may also give a carrier added flexibility in scheduling its flights. When a carrier operates a hub-and-spoke route network, virtually all of its flights either originate or terminate at the hub airport, although some flights may make intermediate stops. Yet, the spokes can be of dramatically different distances. United serves both Los Angeles and Des Moines from its Chicago hub. If a carrier has only one hub, this may require that some aircraft spend substantial time on the ground at the spoke airport or else operate on relatively unprofitable tag-end segments. Thus, adding hubs may permit more efficient scheduling of both aircraft and crews.

Frequent Flyer Programs

In the early years of deregulation, the largest carriers--the trunks--faced competition both from expanding local service carriers and from low-cost new entrants. The trunks could not respond quickly to this outbreak of competition because they had fleets of large planes that could best be used in long-haul markets, and they had high operating costs. Despite the size and established reputation of the trunks, passengers appeared more concerned with fares and schedules when selecting flights. American Airlines developed the "frequent flyer" program as a means of creating a preference for its flights. Other carriers, large and small, copied American's idea, but the programs have proved most advantageous for the largest carriers.

A frequent flyer program is essentially a rebate in the form of free travel.8/ The airline does not issue the rebate, however, until the passenger purchases some minimum amount of service. As the passenger accumulates credits toward this minimum, the incentive to continue using that carrier increases until the rebate is received. Frequent flyer programs are thus an effective means of locking in a customer to the services of a particular carrier.

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8. For further discussion of this issue, see Severin Borenstein, "Hubs and High Fares: Airport Dominance and Market Power in the U.S. Airline Industry," Discussion Paper, Institute of Public Policy Studies, University of Michigan (March 1988).

Passengers generally find that carriers with the largest operations in their hometowns have the most attractive frequent flyer programs. The more extensive a carrier's route network, the more likely it is to serve the markets in which passengers travel, and the more quickly the rebates can be earned. In addition, the more cities that a carrier serves, the more likely it will offer desirable destinations for which passengers can use their rebates.9/

Methods of Influencing Travel Agent Recommendations

To compete effectively, airlines must be able to sell their services widely. Air transportation is quite perishable--an empty seat on a departed flight cannot be sold--and aircraft of efficient size are generally large relative to the number of people traveling at any given time. Moreover, the passengers on a flight tend to be from widely scattered locales, not only within the metropolitan areas of the flight's origin and destination but in other cities as well.

Travel agents have proved to be an effective way of marketing air transportation. The more than 25,000 travel agents dispersed throughout the country are convenient to much of the traveling public. Since travel agents represent virtually all the scheduled airlines, an airline does not have to establish a distribution system when it begins serving a new city. Because they represent virtually all of the carriers, agents have access to comprehensive fare and schedule information; as carriers' fares and routes in the deregulated environment have undergone frequent changes, passengers' demand for such comprehensive information has increased.

Not all passengers exhibit strong carrier preferences despite the efforts of the airlines to create brand loyalty. Even those who have preferences must periodically travel on other airlines, since no carrier serves all markets, and a preferred carrier may not have a flight at a desired time. For those reasons, airlines generally find it profitable to influence travel agents' recommendations. To do this they have developed both sophisticated commission rate structures and computer reservation systems. Because these systems enable their owners to

9. To make a frequent flyer program more attractive, a carrier can purchase from other carriers seats on flights to popular destinations that it does not serve, but this can be expensive.

monitor the behavior of agents, carriers that own computer reservation systems apparently obtain certain advantages in designing travel agent compensation plans.10/

Targeting Commission Rates. Other things being equal, agents will tend to recommend the airline that pays them the most. The return to a carrier from an across-the-board increase in travel agent commissions tends to be small, however, since other carriers can quickly match the increase. Moreover, the higher rate has to be paid for sales the agents would have made in any case.11/

As a result, airlines have increasingly targeted the payment of travel agent commissions to cases in which the agents can influence the flights passengers select. For example, an airline may estimate the number of flights an agent is likely to book during any period and pay higher commission rates--a "commission override"--for bookings above that number. Commission overrides generally apply to total agent sales, but they can also be targeted at particular markets and particular flights.12/ Such targeting can be especially important when a carrier promotes a new service or responds to new competition.

Overrides tend to be less costly to large carriers than to smaller carriers.13/ Passengers will frequently request the larger carrier's flights because of its accepted brand name and its full schedule of flights. Hence, it will need to pay overrides on a relatively small share of its bookings to influence travel agent behavior. In contrast, a smaller carrier with a smaller presence in a city will often have to pay overrides on a much larger share of its bookings.

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10. See, for example, Michael Levine, "Airline Competition in Deregulated Markets," pp. 458-464.

11. An across-the-board increase in the commission rate is in some respects like a fare decrease: the carrier that initiates the change hopes that the additional traffic will more than compensate for the lower revenue from passengers who would have flown in any case. There is an important distinction, however: a fare decrease stimulates traffic, while in most cases, an increase in commission rates does not.

12. In some cases, commissions may be rebated by the travel agent to the purchaser. This is most likely to occur when agents sell to relatively large business accounts.

13. For a discussion of the impact on competition of such behavior, see Steven Salop and David Scheffman, "Raising Rivals' Costs," *American Economic Review* (May 1983), pp. 267-271.

Computer Reservation Systems (CRS). Airlines have found computer reservation systems to be extremely helpful in influencing travel agents' recommendations. By monitoring the behavior of individual agents, airlines can design commissions that will have the optimum impact on their flight recommendations. Developing and operating these systems is quite expensive, however, and only the largest carriers have been able to market them.14/ At present, the seven largest carriers all own at least a share of a CRS.

Origin of the Systems. In the 1970s, airlines began modifying and enhancing their internal reservation systems to make the sale of airline tickets through travel agents more efficient. The CRS gave travel agents access to information about flight schedules, fares, and seat availability. It also enabled them to make reservations and issue tickets automatically.15/ Although the computer reservation systems are owned and operated by particular airlines, an agent can use one to get information and make reservations on virtually any scheduled carrier.

Since the systems make both airlines and travel agents more productive, CRS owners charge both of them for the use of their systems. Travel agents rent the equipment, while airlines pay a booking fee for each flight reservation. American Airlines introduced the first computer reservation system; United, TransWorld, Eastern, and Delta each followed with systems of their own. American and United, however, dominate the CRS industry; in 1986, they accounted for 41 percent and 33 percent, respectively, of the flight segments booked through computer reservation systems.

The influence of computer reservation systems on bookings can be seen in two facts. First, a relatively large proportion of the travel agents in a city where a carrier operates a hub use that carrier's CRS. If the systems did not influence the behavior of travel agents, there would be little reason for carriers to market them most aggressively in cities where they center their operations. Moreover, at present all the

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14. For a detailed description of computer reservation systems, see Department of Transportation, *Study of Airline Computer Reservation Systems* (1988).

15. Before the development of computer reservation systems, an agent had to make a reservation via telephone and then manually write the ticket. This manual system is still used by the relatively few travel agents who do not use a CRS.

computer reservation systems are owned and operated by airlines. While the airlines have found the systems to be profitable, the one system that was not owned by an airline has ceased operating.16/

In the beginning, at least, the profitability of the computer reservation systems stemmed not from the fees paid by travel agents or other airlines, but from the systems' ability to influence directly the recommendations of travel agents.17/ Since agents tend to suggest the flights that are listed first on the computer screens, CRS owners displayed their own flights most prominently.18/ In its last significant regulatory act, the CAB prohibited the use of carrier identities in determining the order in which flights are listed by computer reservation systems.

But even without this "display bias," the systems apparently still generate significant benefits for their owners. A recent Department of Transportation study found that the two largest systems are quite profitable, and a significant source of these profits is the tendency of agents to book flights on the carriers that own the systems the agents use. One possible explanation for this so-called "halo effect" is that agents believe such practices reduce the chance of error. In fact, there have been periodic complaints that CRS owners have failed to load the fare and schedule changes of other carriers into their systems promptly. Another possible explanation is that the systems enable their owners to develop effective commission overrides.

Booking Fees. The CAB's final significant regulatory act also required that differences in carrier booking fees be justified by differences in costs. To encourage competition among CRS owners, the CAB also ordered that leases by travel agents of computer reservation systems could not exceed five years. The CAB reasoned that longer-term

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16. See Department of Transportation, *Study of Airline Computer Reservation Systems*, pp. 39-89.

17. See General Accounting Office, *Airline Competition: Impact of Computerized Reservation Systems* (May 1986).

18. When requesting schedule information, agents specify a desired departure time. But CRS owners used carrier identity--not just departure time--in determining the order in which flights were displayed. Carriers could secure a more prominent display--although not as prominent as that of the CRS owner--by paying a higher booking fee. The cost of more prominent display tended to be highest for carriers who both competed directly with the CRS owner and did not have a computer reservation system of their own.

contracts would unnecessarily limit competition by preventing agents from switching systems.

While the CAB hoped that its order would stop the hue and cry about computer reservation systems, it only changed the nature of the complaints. In response to the board's order, the CRS owners eliminated display bias, but they also increased booking fees. Carriers now maintain that these fees are too high. In essence, they are saying that CRS owners have market power: before the board's rule, the owners exercised this power by biasing their schedule displays, but now they exercise it by charging high fees. The simple fact is that carriers must sell through travel agents in order to compete, and hence their flights must be available through computer reservation systems. The CRS owners would, therefore appear to have substantial latitude in setting booking fees. The Department of Transportation study concluded that booking fees charged by CRS owners significantly exceed the cost of the service provided to the carriers.19/

MERGERS

Some analysts fear that the recent merger wave has set the stage for a significantly less competitive industry in years to come. It is likely, however, that the most important factor behind the industry's consolidation was a desire to achieve some of the advantages of size. If these advantages are substantial, smaller carriers will have higher costs than the larger carriers and will not be able to compete effectively. To that extent, the mergers may have helped to create more viable competitors. There can be little question, however, that several of the mergers have led to reduced competition in some markets.

The Approval Process

The Airline Deregulation Act required airlines wishing to merge to seek approval beforehand from the Civil Aeronautics Board. The CAB, in turn, had to rule on an application within six months. The Department of Transportation assumed this responsibility after the

19. Department of Transportation, *Study of Airline Computer Reservation Systems*, pp. 91-112.

sunset of the CAB.20/ As with other industries, mergers among airlines that may tend to reduce competition are prohibited.

Since the passage of the Airline Deregulation Act, there have been at least 15 mergers or acquisitions involving two airlines that both provided scheduled domestic jet service.21/ In a number of other cases the government approved mergers between such carriers that were never consummated. In only two cases--both in 1979--did the responsible government agency fail to approve a proposed merger.22/ In approving Texas Air's 1986 acquisition of Eastern, however, the Department of Transportation required Texas Air to sell takeoff and landing rights at Washington and New York. A Texas Air subsidiary, New York Air, provided the only significant competition to Eastern's air shuttle in the New York to Boston and New York to Washington markets.

Although the high approval rate might seem to suggest lax enforcement, few of the mergers raised significant competitive concerns. Most were between carriers that operated in different parts of the country and therefore served few of the same routes. In two cases, the acquired firms were in financial distress that threatened their continued existence.23/ While there was substantial competitive overlap in these two cases, any adverse effect on competition was probably small. It is doubtful that another carrier would have acquired the firms, or that the acquired airlines would have been able to continue operating independently.

The Department of Transportation did approve two mergers between carriers that competed on many of the same routes and were financially viable. Northwest and Republic, which merged in 1986, each operated a hub at Minneapolis-St. Paul. They competed in 26

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20. Beginning in 1989, however, mergers in the airline industry, like those in other unregulated industries, will no longer be subject to mandatory prior approval.

21. The Department of Transportation also approved the United Airlines purchase of the division of Pan American that provided air service over the Pacific Ocean.

22. The Civil Aeronautics Board explicitly rejected a proposed merger between Continental and Western. Eastern's application to acquire National Airways was rejected by an administrative law judge. Eastern, however, never pressed its application before the Board.

23. These included the Texas Air acquisition of People Express and the Southwest acquisition of Muse.

nonstop markets involving that airport and accounted for 80 percent of the airport's passengers.24/ They also competed on 18 other nonstop routes and in scores of other markets. The merger of TWA and Ozark, both of which maintained hubs at St. Louis, was also approved.

The Department of Transportation's Merger Policy

Compared with markets for most goods and services, those for airline service are served by relatively few firms. Most city-pairs simply do not have enough traffic to support service by more than one or two carriers in efficient-sized aircraft. When the Congress passed the Airline Deregulation Act, the average city-pair with nonstop flights was served by 1.4 carriers. It was understood that, even with free entry, airline markets would remain concentrated.

The Congress deregulated the airlines because it believed that carrier behavior would be sensitive to entry and the threat of entry despite high levels of concentration--that is, the Congress paid greater attention to the conditions of entry than to the current competitive structure. In evaluating mergers, the Department of Transportation has followed a similar approach. It has focused primarily on whether other carriers would be able to enter the markets served by the new carrier if it succeeded in raising prices above costs. In its analyses, the department has essentially concluded that entry into most city-pairs remains relatively easy.

But the industry has changed significantly under deregulation. The factors discussed above--route networks, frequent flyer programs, computer reservation systems, and commission overrides--were not seriously considered, or did not even exist, at the time deregulation was being debated. These developments have given large carriers certain advantages, and they have also made entry more difficult.

Factors Making Entry More Difficult. A substantial proportion of the passengers on most nonstop flights are traveling to or from other

24. Department of Transportation, *NWA-Republic Acquisition Case*, Docket 43754, July 31, 1986. The passenger shares are based on the numbers of passengers boarding planes at the airport.

points. It follows, therefore, that an airline must attract a substantial number of such passengers to sustain a viable service on most nonstop routes. Simply having airport space and aircraft is not sufficient.25/ The importance of carrying connecting passengers is the reason that the vast majority of flights either originate or terminate at the hub of the carrier that operates the flight.

Frequent flyer programs and computer reservation systems can make it difficult for an airline to attract passengers originating at another carrier's hub. Travelers tend to join the frequent flyer programs of the principal carriers serving their cities; those carriers generally offer flights to the greatest number of destinations, and travelers can earn travel awards more rapidly by using them. Passengers on their way to winning awards with a given carrier will often be reluctant to use the services of an entrant. Computer reservation systems enable airlines owning them to encourage travel agents to recommend the flights of the CRS owners. Since a CRS is clearly of greatest advantage to a carrier where it operates a hub, CRS owners often market their systems most aggressively at their hub cities.

The mergers of Northwest-Republic and TWA-Ozark doubtless decreased competition in many of the markets involving Minneapolis and St. Louis. Despite the Department of Transportation's reasoning, it is doubtful that other carriers would be able to enter many of those markets quickly if fares rose significantly. In fact, there is ample statistical evidence that, other factors being equal, passengers in more concentrated markets pay higher fares.26/ There is also evidence that the greater a carrier's share of total traffic at an airport, the higher the fare it is able to charge. A possible explanation for this finding is that carriers have greater difficulty in entering markets served from concentrated hubs.27/

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25. Securing the necessary airport facilities at a reasonable price is quite difficult in some airports. This can sometimes be a barrier to competition.

26. See, for example, David Graham, Daniel Kaplan, and David Sibley, "Efficiency and Competition in the Airline Industry," *Bell Journal of Economics* (Spring 1983), pp. 118-138, and Steven Morrison and Clifford Winston, "Empirical Implications and Test of the Contestability Hypothesis," *Journal of Law and Economics* (April 1987), pp. 53-66. For a different perspective, see Franklin Fisher, "Pan American to United: The Pacific Division Transfer Case," *RAND Journal* (Winter 1987), pp. 492-508.

27. See S. Borenstein, "Hubs and High Fares."

Offsetting Factors. The reduction in competition resulting from mergers may be offset, at least in part, by certain gains in efficiency. Most notably, the merged carrier may be able to redeploy its aircraft. As part of this process, some cities will receive reduced service and higher fares, but other cities will receive new service. In fact, the number of cities receiving nonstop service from the Minneapolis-St. Paul airport has increased significantly since the Northwest-Republic merger. This provides more convenient service to passengers traveling to or from Minneapolis-St. Paul, as well as those making connections at the airport. It also makes the airport more competitive with the hubs of other carriers. Also noteworthy is the fact that Minneapolis-St. Paul and St. Louis were the two smallest airports in which more than one carrier operated a hub in 1985 (see Table 5). This raises the question

TABLE 5. AIRPORT SIZE AND CARRIER HUB OPERATIONS, 1985

Airport	Average Daily Departures	Carriers Operating Hubs (Percentage share of departures in parentheses)
Chicago O'Hare	814	United (41), American (24)
Atlanta	778	Delta (46), Eastern (42)
Dallas/Ft. Worth	577	American (52), Delta (29)
Denver	487	United (30), Frontier (26), Continental (25)
St. Louis	399	TWA (44), Ozark (32)
Minneapolis/St. Paul	307	Republic (44), Northwest (39)
Pittsburgh	300	USAir (81)
Phoenix	278	America West (35)
Houston	232	Continental (57)
Memphis	214	Republic (60)
Detroit	166	Republic (52)
Charlotte	164	Piedmont (67)
Salt Lake City	158	Western (67)
Houston-Hobby	157	Southwest (52)
Dallas-Love Field	132	Southwest 84)
Chicago Midway	68	Midway (77)

SOURCE: Congressional Budget Office, from Federal Aviation Administration, *Airport Activity Statistics* (1986).

NOTE: A carrier is considered to operate a hub if it has more than 50 flights a day at an airport, and is not located on either the east or west coast.

whether those cities could have con-tinued to support the hub operations of two carriers.

Although there may be reason to question the analysis of the Department of Transportation in several of its merger decisions, these decisions did not play a large role in the consolidation of the industry.28/ Partly because of the marketing initiatives of the carriers, and partly because of the convenience and efficiency of hub-and-spoke operations, most carriers have to be relatively large to compete effectively. And although certain markets have been adversely affected by these mergers, the airline industry seems overall to be performing reasonably competitively.

28. For a critical review of the Department's merger policy, see statement by Kenneth Mead of the General Accounting Office before the Subcommittee on Transportation of the Senate Committee on Appropriations, April 21, 1988.

CHAPTER III

AVIATION SYSTEM CAPACITY AND THE PROBLEMS OF CONGESTION AND DELAY

Aviation infrastructure consists of two closely coordinated but separate systems, the airway system and the airport system. The airway system controls an aircraft from the time it leaves the gate at its originating airport to the time it arrives at its destination. The airport system includes over 3,000 airports with their terminal buildings, gates, taxiways, and runways.

The federal government, through the Federal Aviation Administration, constructs and operates the airway system. The FAA also provides support for and coordination among airports for the planning and development of the airport system. System users and general taxpayers fund the airway system. For the most part, airport users, along with state and local governments, fund the airports.

Congestion is the product of constraints on airport capacity, the limitations of the airway system, and the demands placed on both systems by those using them. The demand for air transportation has increased greatly over the last five years and is projected to grow steadily through the end of the century. The prospects for building new airports or greatly expanding existing airports are poor, so that without further government action congestion will most likely worsen in the future. Delays, which have been one approach to allocating capacity in the face of excess demand, may be expected to worsen as well. Attempts have been made to deal with the problem of congestion through such measures as shifting schedules or administratively allocating takeoff and landing rights. The use of prices to allocate scarce capacity is an alternative that has not been widely applied.

The current federal approach to the airways treats them like the highways: they are open and available to all who want to use them. But when highways grow congested, efforts are made to remove the congestion--by building new roads, restricting access, or imposing tolls that will rationalize their use. Given the formidable barriers to new

airport construction, the search for solutions to congestion of the aviation system must focus on the other two options.

THE AIRWAY SYSTEM

Airways are corridors of air space analogous to highways. The FAA monitors these routes to maintain aircraft separation, advise aircraft of traffic conflicts, and warn of adverse weather conditions. Congestion and delays result from weather conditions, equipment limitations, and the peaks in demand caused by passenger travel preferences and airline hub operations.

Description of the System

The airway system is divided into three parts: air route traffic control, terminal traffic control, and flight service stations. The FAA is modernizing, automating, and expanding its airway facilities under a program called the National Airspace System Plan. The plan aims to eliminate outmoded and obsolete equipment, and to improve the system's reliability and safety. It should also improve the system's ability to handle traffic in periods of bad weather, which is the major source of delay in the airway system.

Air Route Traffic Control. Air route traffic control is provided by 20 Air Route Traffic Control Centers (ARTCC) in the contiguous 48 states.1/ These centers monitor commercial air carriers and general aviation aircraft flying under instrument flight rules (IFR) between airports. Flight into controlled airspace requires permission from the air traffic controllers monitoring the air routes at these centers.

Terminal Traffic Control. Terminal traffic control is provided at airport facilities around the country. Terminal Radar Approach Control facilities handle aircraft after they leave the control of the en route ARTCC centers until they land at their destinations. These

1. There are four additional centers outside the continental United States in Anchorage, Honolulu, San Juan, and Guam.

facilities maintain aircraft separation, space arrivals at the airport, and align aircraft for approach and landing on the proper runway. Airport Traffic Control Towers handle the approach at airports without radar facilities, and control aircraft on the ground from runway touchdown to arrival at the airport gates.

Flight Service Stations. The third element of the airway system consists of over 300 flight service stations, providing services primarily to general aviation aircraft. These services include filing and closing (after trip completion) of aircraft flight plans, weather briefings, communication with pilots flying under visual flight rules (not flying IFR under ARTCC control), and aid to pilots in distress.

At present, all three parts of the airway system are quite labor intensive. Basic data are provided by an extensive system of radars, computers, and radio communications equipment. Yet, the handling of aircraft and transfer of information between pilots and ground facilities and among ground facilities has not been automated to a significant degree. Moreover, operation and maintenance costs for the system's obsolescent equipment are high.

Funding of the Airway System

The system is funded in part by the Airport and Airway Trust Fund and in part by appropriations from the general fund of the Treasury.

The Trust Fund. The Airport and Airway Trust Fund receives revenue from aviation excise taxes paid by users of the aviation system and from interest on its cash balance (invested in Treasury securities). The taxes consist of an 8 percent tax on domestic passenger tickets, a $3 international departure tax, general aviation fuel taxes of 12 cents per gallon on gasoline and 14 cents per gallon on other fuels, and a 5 percent waybill tax on air cargo shipments. The 8 percent ticket tax has accounted for nearly 88 percent of annual trust fund tax receipts over the last five years. Figure 5 shows the average contribution of each revenue source in that period (see first pie chart).

The trust fund finances about half of Federal Aviation Administration spending (see second pie chart, Figure 5). The airport grants-

Figure 5.
Trust Fund Revenues and FAA Outlays

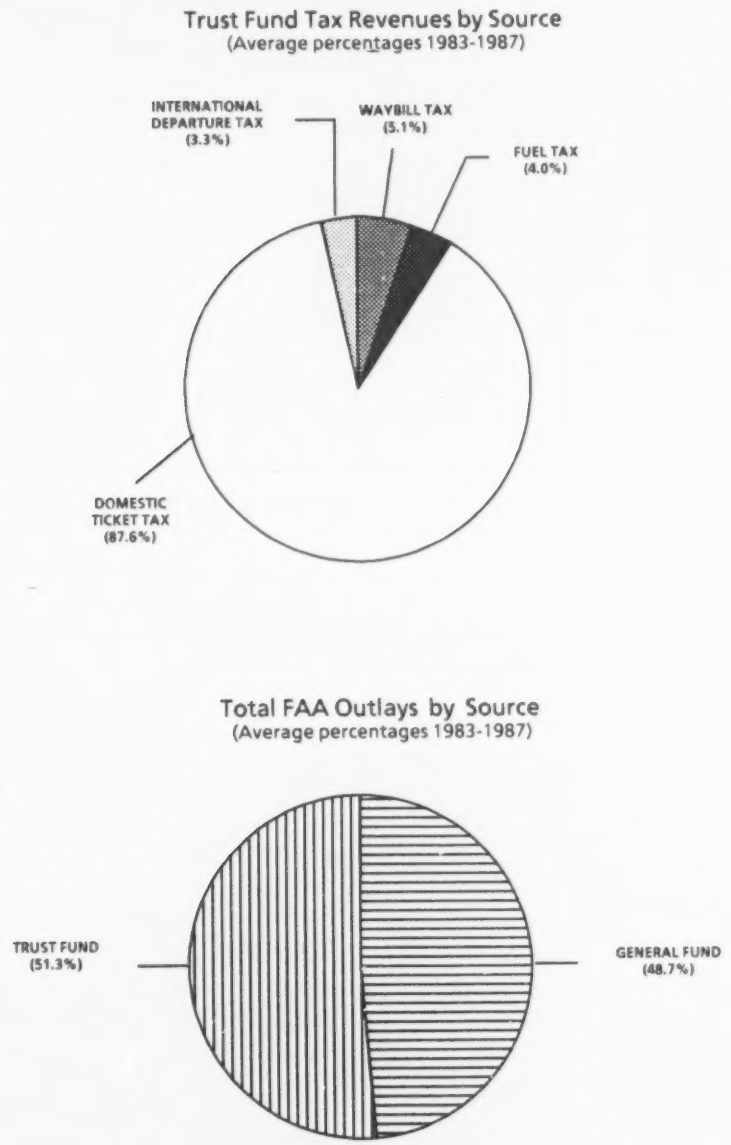
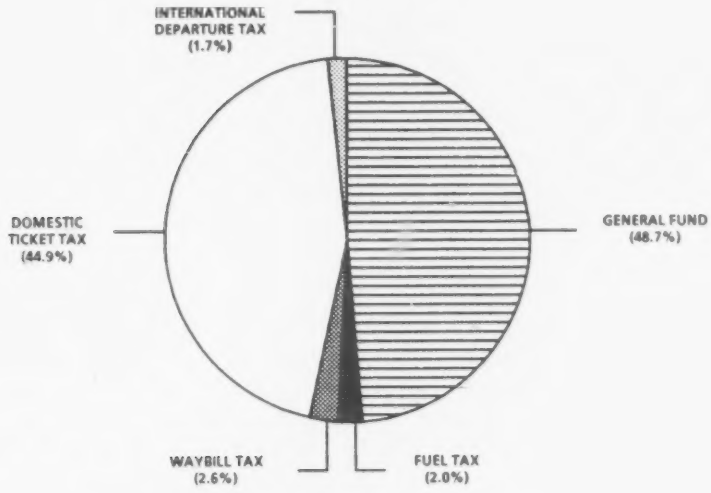
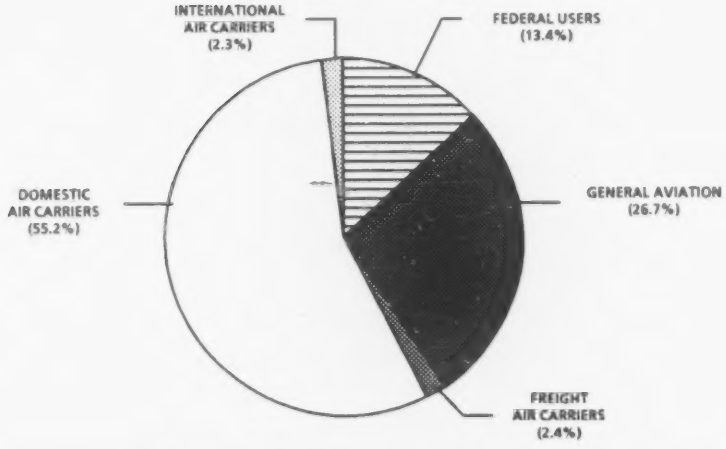


Figure 5.
Continued

Total FAA Outlays by Revenue Source
(Average percentages 1983-1987)



Users' Shares of Total FAA Costs
(FAA cost allocation study for 1985)



SOURCE: Congressional Budget Office, from Department of Transportation data and the Appendix to the Budget of the United States.

in-aid program and capital expenditures for the airway system (for research, engineering and development, and facilities and equipment) are fully financed by the trust fund. The trust fund also makes transfers to the National Oceanic and Atmospheric Administration for the Aviation Weather Services program.

FAA operating costs include the operation and maintenance of the airway system and safety regulation. The trust fund covers only part of these costs, however. And because of limits imposed in the trust fund authorizing legislation, the percentage of FAA operations funded by the trust fund varies each year. Over the last five years, the trust fund has paid for 25 percent of FAA operations, and the remainder has come from general fund revenues.

Nonfederal users of the aviation system do not pay all the costs incurred by their use. Taxpayers have been subsidizing nonfederal users since the trust fund was established. In fact, this subsidy has helped to create a surplus in the trust fund. General aviation has benefited most from the subsidy, while airline passengers have paid nearly their full costs. The third and fourth pie charts in Figure 5 show user contributions to FAA outlays and the FAA estimates of each user's actual share of FAA costs. The shadings in the top chart, showing the sources of revenue, correspond to those of the users in the bottom chart who supply that revenue. While nonfederal users of the system are demanding increases in system investment to reduce the trust fund surplus and increase capacity, the excise taxes they pay are clearly insufficient to finance the costs of the system. Moreover, since taxes do not vary with the demands placed on the system, they do not serve to regulate excess demand.2/

Capacity Problems in the Airway System

Airway system delays account for only about 20 percent of all delays experienced by air travelers. Of the airway system delays, about 70 percent are caused by bad weather; the rest result from congestion in

2. For a complete analysis, see the forthcoming Congressional Budget Office study on the Airport and Airway Trust Fund.

the traffic control systems.3/ Airline hubbing practices, air traffic control equipment, and staffing problems contribute to and exacerbate this congestion. (Airline hubbing practices are examined more fully in the airport section below.)

The 1981 air traffic controllers' strike, and the firing of three-fourths of the controller work force, led to severe staffing shortages within the airway system. Until 1983, limits were placed on air traffic at the nation's 22 busiest airports, handling more than half of air travelers. The FAA assigned each of these airports an hourly quota of takeoffs and landings--commonly referred to as "slots." The number of slots available at each airport was determined by the level of operations that could be handled safely by both the terminal control facilities and the en route control centers. The controller work force has now been largely rebuilt, and the constraints have been eliminated at these airports.4/

At the same time that traffic has been growing and the airway system has suffered from staff shortages, the traffic control equipment in place is obsolescent and increasingly difficult and expensive to maintain. The FAA's plan to modernize its equipment has fallen behind schedule because of developmental problems and funding constraints. While the program is being accelerated, the system will for some time be hampered by equipment that is less reliable and has less capacity than current demands on it may require. In order to preserve the level of safety in the system, the FAA has no choice but to limit traffic, especially in periods of bad weather.

THE AIRPORT SYSTEM

While some of the present congestion can be ascribed to the limitations of the airway system, much of it stems from capacity and operational problems at large commercial airports. These airports handle

3. While weather problems are the immediate cause of the majority of delays, increased capacity in the airway system would enhance the ability of air traffic controllers to handle traffic and reduce delays during periods of bad weather.

4. Slot restrictions that existed before the controllers' strike remain in place at the four capacity-controlled airports.

nearly all commercial passengers, and have borne the brunt of the rapid changes in airport demands resulting from deregulation. The development of hubbing, and rapid traffic growth, are straining the peak capacity of many of these airports.

Structure of the Airport System

Over 3,000 airports make up the airport system.5/ These are grouped into three categories, depending upon their use:

- Commercial service airports, which serve scheduled commercial airline traffic and handle at least 2,500 passengers per year. There are 550 commercial service airports.
- Reliever airports, which serve general aviation traffic (private, noncommercial planes, such as business and pleasure fliers). Their name derives from their function: relieving a nearby commercial service airport of this traffic. There are 244 reliever airports.
- General aviation airports serving business, corporate, and pleasure fliers. There are 2,449 general aviation airports.

Nearly all commercial air travelers use 72 large commercial airports.6/ In 1986, these airports handled 89 percent of all passenger enplanements.

Financing the Nation's Airports

The airports are generally owned and managed by local authorities. Financial support, however, is provided by a combination of federal,

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5. Much of this discussion is based on the Federal Aviation Administration's *National Plan of Integrated Airport Systems (NPIAS) 1986-1995* (November 1987). There are over 16,000 public and private airports in the United States. But only airports that are open to the public, that are considered of national interest, and that are eligible for federal grants are included in the National Plan of Integrated Airport Systems (NPIAS) and are discussed here.

6. These include airports classified by the FAA as large or medium hub airports. Large hub airports are commercial service airports that handle 1 percent or more of commercial passenger enplanements; medium hub airports are commercial service airports that handle between 0.25 percent and 1 percent of passenger enplanements.

state, local, and private resources. Airport operating costs are financed by fees charged to users of the airports. These include landing fees and rental of terminal space for air carriers; income from concessions on airport property such as parking, food service, and car rentals; and charges to general aviation for landing, tie downs, and terminal and hangar use.

Airport investment costs are funded primarily by a mix of federal grants and private bonds backed by air carrier agreements and guarantees. The specific sources of investment financing, and the percentage of funding from any one source, vary between airport size categories and among airports of the same size. Table 6 shows the range of sources of airport investment.

Large commercial airports finance most of their investment themselves. Though the federal government accounts for only about 20 percent of the outlays at these major airports, they absorb over half of all federal airport investment. Other commercial airports rely to an increasing degree on federal support as their level of commercial passenger traffic declines. Reliever and general aviation airports also rely heavily on federal support, receiving three-fourths of their investment funds from federal grants. As with the smaller commercial airports, their revenue sources may not be secure enough to induce private investors to finance a substantial proportion of their capital investment with long-term bonds.

Federal Investment. Federal support for airport investment is provided through grants awarded under the Airport Improvement Program. Airport grant assistance can be used only for planning and construction of "airside" improvements (including runways and taxiways, public terminals, and noise and safety-related investments) and for planning and coordination with other local airports.

The airport program distributes annual grants according to an allocation formula. Up to 49.5 percent of funds go to primary, commercial service airports as entitlements based on annual passenger enplanements, with 3 percent of total grants earmarked for cargo airports. An additional 12 percent of annual funds go to the states for distribution to general aviation airports. And at least 38.5 percent of funds go into a discretionary fund for distribution by the Secretary of Transportation.

TABLE 6. SOURCES OF AIRPORT INVESTMENT

Airport Category	Number of Airports [a]	Percent of National Investment	Percent of Investment from: Federal Grants	Bond Proceeds	Other
Commercial Airports					
Primary					
Large hubs [b]	29	43	20	80-100	0
Medium hubs [c]	43	19	25	60-80	Under 15
Small hubs [d]	67	13	40	20	40
Nonhubs [e]	139	5	60	20	20
Other Commercial [f]	272	5	80	20	0
General Aviation Airports					
Relievers [g]	244	6	75	8-10	Over 17
Other General Aviation [h]	2,449	10	75-80	i	Under 25
All Airports	3,243	100	35-40	50-65	Under 15

SOURCES: Congressional Budget Office, *Financing U.S. Airports in the 1980s* (April 1984) and Federal Aviation Administration, *National Plan of Integrated Airport Systems (NPIAS) 1986-1995* (November 1987).

a. Includes airports classified by the FAA as in the national plan of integrated airport systems.

b. Large hubs enplane 1 percent or more of national revenue passengers.

c. Medium hubs enplane between 0.25 percent and 1 percent of national revenue passengers.

d. Small hubs enplane between 0.05 percent and 0.25 percent of national revenue passengers.

e. Nonhub airports enplane between 0.01 percent and 0.05 percent of national revenue passengers.

f. Other commercial airports are all other airports having more than 2,500 annual revenue passenger enplanements.

g. Reliever airports are airports in metropolitan areas that are intended to reduce congestion at large commercial service airports by providing alternative landing areas. Most relievers handle only general aviation; some also handle commercial flights.

h. Other general airports are all other airports handling nonscheduled flights.

i. Negligible.

Another requirement is that at least 10 percent of all funds go to reliever airports, 10 percent to noise abatement projects, 2.5 percent to small, commercial service airports, and 0.5 percent for integrated airport system planning grants. The discretionary funds are used to assure that these limitations are met, given the projects approved in the first two categories of the grant program.

Private Investment. Air carriers provide much of the support for private investment in airports, generally through financing agreements negotiated between airports and their tenant airlines. These "airport use agreements" assure the airports of sufficient revenue to cover their operating and maintenance costs and to retire the debt incurred to finance terminals, parking facilities, roads, and the portion of "airside" investments not financed by federal grants. The financing agreements for large commercial airports are generally either residual cost or compensatory agreements. In the residual cost approach, tenant airlines collectively agree to cover any airport costs that cannot be attributed to and recovered from other airport users. In the compensatory cost approach, the airports set fees for the use of airport services and facilities, taking the risk that traffic may not be high enough to cover costs.

About half of the large airports use residual cost agreements. While these agreements limit the airports' financial risk, they give tenant airlines a large voice in the operation of the airport and in any new investment that, while increasing capacity, would increase their costs. Airports financed in this fashion may act like local monopolists, providing less than optimal capacity and charging prices higher than would otherwise be realized. While these agreements provide an incentive to maximize the revenue earned from nonairline sources, they offer less incentive for properly pricing the services that airlines use.

Capacity Problems in the Airport System

Congestion in the aviation system arises from many sources. On the demand side, the principal factors are hubbing and peaks in travel. On the supply side, the principal constraints are airport capacity, airway staffing, and the outdated and limited capability of airway equip-

ment. The latter two were discussed above in the airway section, while airport congestion is examined more fully below.

Traffic has grown tremendously since deregulation of the airline industry began in 1978, from 267 million passengers a year in 1978 to 444 million passengers in 1987. Airport congestion and delays are concentrated at large commercial airports: weekly airplane departures have grown by 64 percent at these large airports as compared with 47 percent at the small commercial airports.7/ Further, the FAA forecasts that passenger enplanements at large airports will grow another 85 percent by the year 2000, and that aircraft operations will grow by 41 percent. The FAA considers 13 large airports to be congested, and expects an additional 34 to become congested by 2000. In total, the FAA expects 58 airports (47 of which are large airports), handling 76 percent of all passengers, to be congested by the turn of the century.8/

Traffic Peaks. An important contributor to airport congestion has been the growth in airline hub-and-spoke operations. The hub-and-spoke system creates local, peak congestion problems. At certain times each day, numerous flights arrive in quick succession; passengers transfer to other aircraft; and again, in quick succession, planes leave for their destinations. Figure 6 shows this peaking pattern at four representative large airports, while Figure 7 shows the percentage of flights delayed during each hour at these same airports.9/ While the correlation between airport peaks in Figure 6 and delays in Figure 7 is not perfect, there is an apparent relation between the two.

The growth of hub-and-spoke route systems has led to a substantial increase in the percentage of flights controlled by the leading carrier at a number of airports. While some critics have expressed concern about the ultimate effect of this increase in concentration on competition, it may help alleviate congestion. An airline that controls

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7. Small commercial airports in this study include those airports classified by the FAA as small hub, nonhub primary, and other commercial service airports. There are 478 small commercial airports.

8. For a discussion of how the FAA defines congested airports, see Federal Aviation Administration, *National Plan of Integrated Airport Systems*, p. 12. Also see Office of Technology Assessment, Airport System Development (August 1984), pp. 45-55.

9. Atlanta is one of the busiest airports in the country with two airlines hubbing there. Memphis and Pittsburgh are each hubs for one major airline. San Francisco is a major origination and destination airport, but not the center of a significant hub-and-spoke operation.

most of the flights at an airport tends to bear a large share of the costs of the added delay that arises from scheduling more flights--the flights of the dominant carrier are the most likely to be delayed. In contrast, an airline with a small share of operations at an airport faces little of the cost of the added congestion.

Peaks in traffic also result from passenger travel preferences. People generally want to travel either early in the day or late in the day. This can lead to morning and evening congestion even at airports that may not otherwise be congested. Peaks can also occur because of weekly and seasonal travel patterns. And since airlines tend to schedule their flights to leave on the hour and half hour, there can be peaks within the hour as well as within the day.

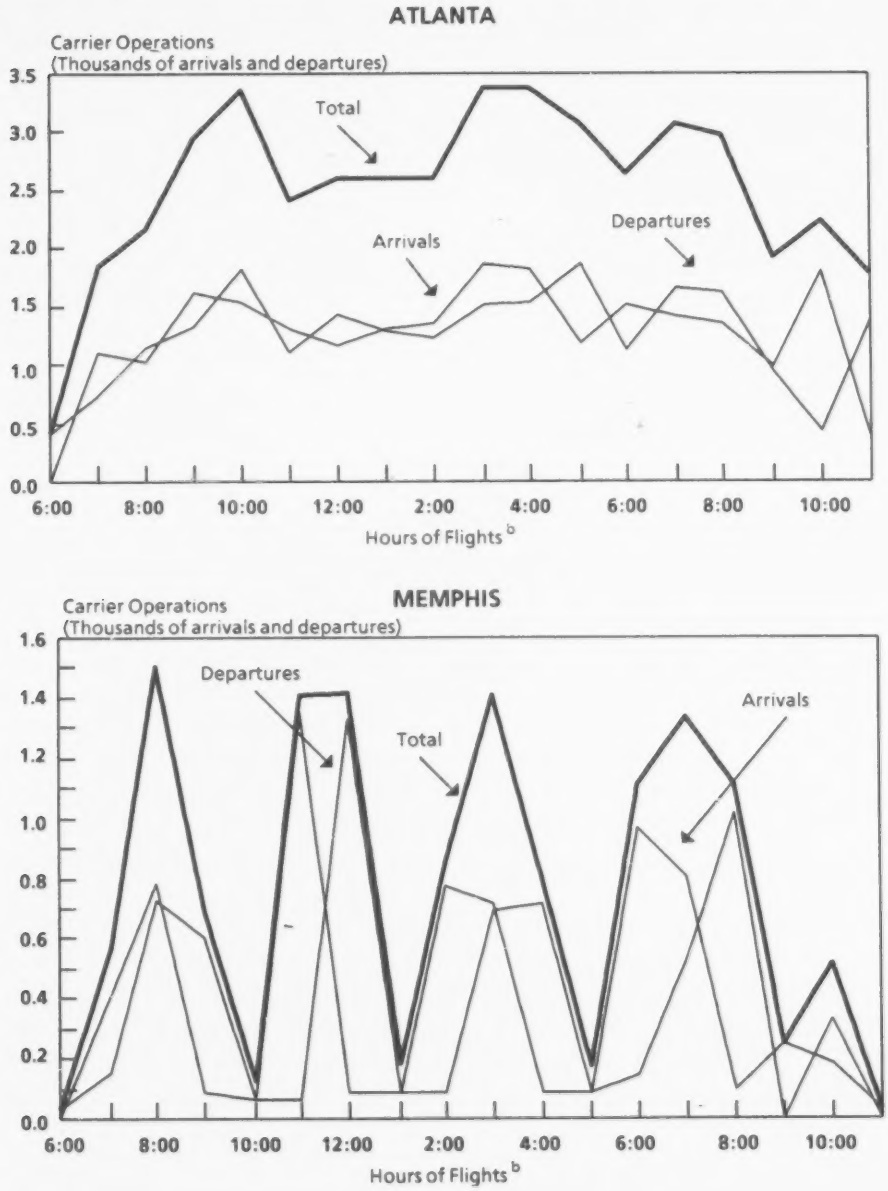
Expansion of Capacity. The prospects for new commercial airport capacity are limited by a number of factors. First, in large urban areas, land is scarce and relatively expensive. This generally limits the expansion of existing airports and requires new airports to be built far from urban centers. Moreover, public concern over airport noise may lead to efforts to prohibit airport development or to delay development if a site is found. Some increase in runway capacity may be obtained, at existing airports by improving aprons, taxiways, lighting, and ground control of airplanes.

In addition, airlines using congested airports often prefer marginal, less costly improvements in the current airport to the much more costly alternative of building a new airport. A major expansion of capacity may also be seen by an airline as facilitating the entry of other carriers into its markets.

Even in areas where new airports are currently planned (Denver, Farmington, N.M., Austin, and San Diego) or under consideration, the time between the beginning of planning and the opening of an airport can stretch to several decades because of the abovementioned problems. For these reasons, new airport construction is unlikely to have much effect on capacity or congestion in the near future.

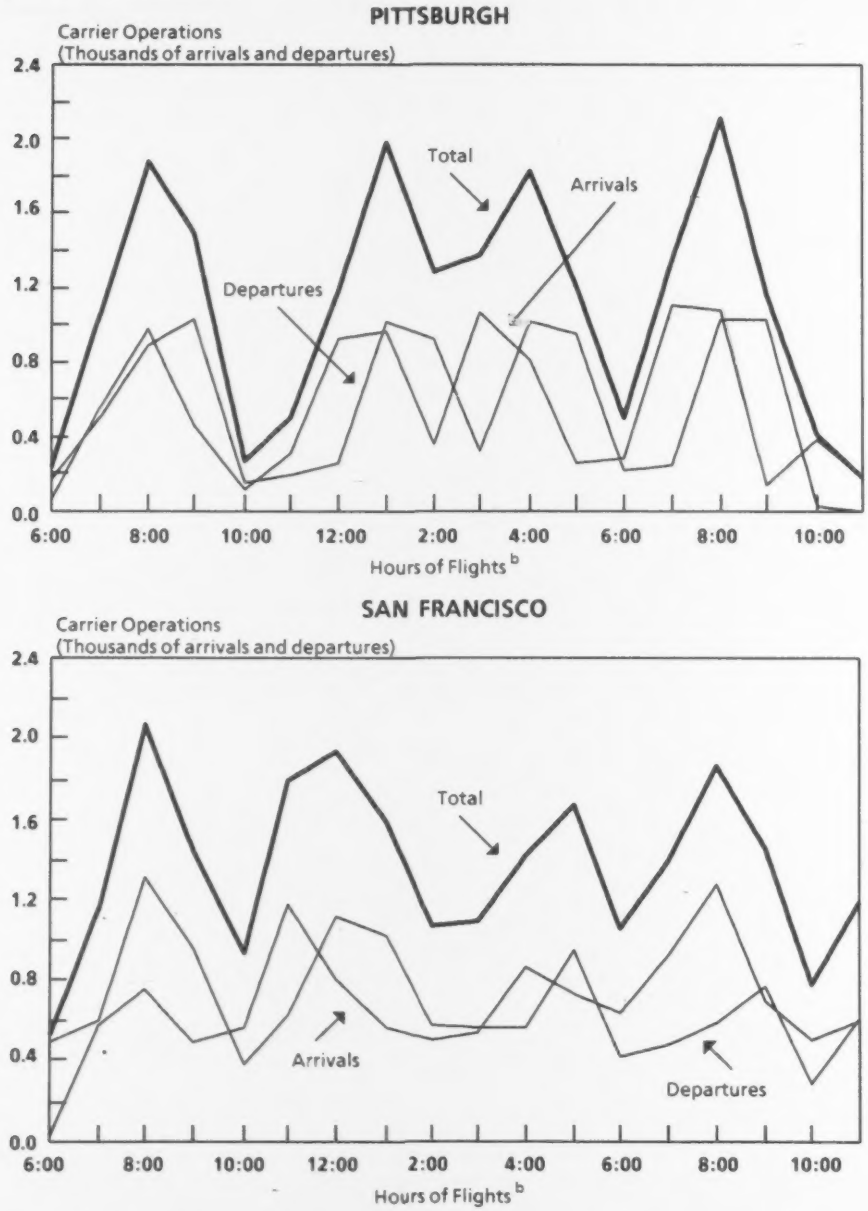
Greater potential for increasing capacity at some airports may be offered by changes in operating practices. For example, the installation of microwave landing systems may permit fuller use of runway

Figure 6.
Flight Operations of 14 Reporting Air Carriers, October 1987 [a]



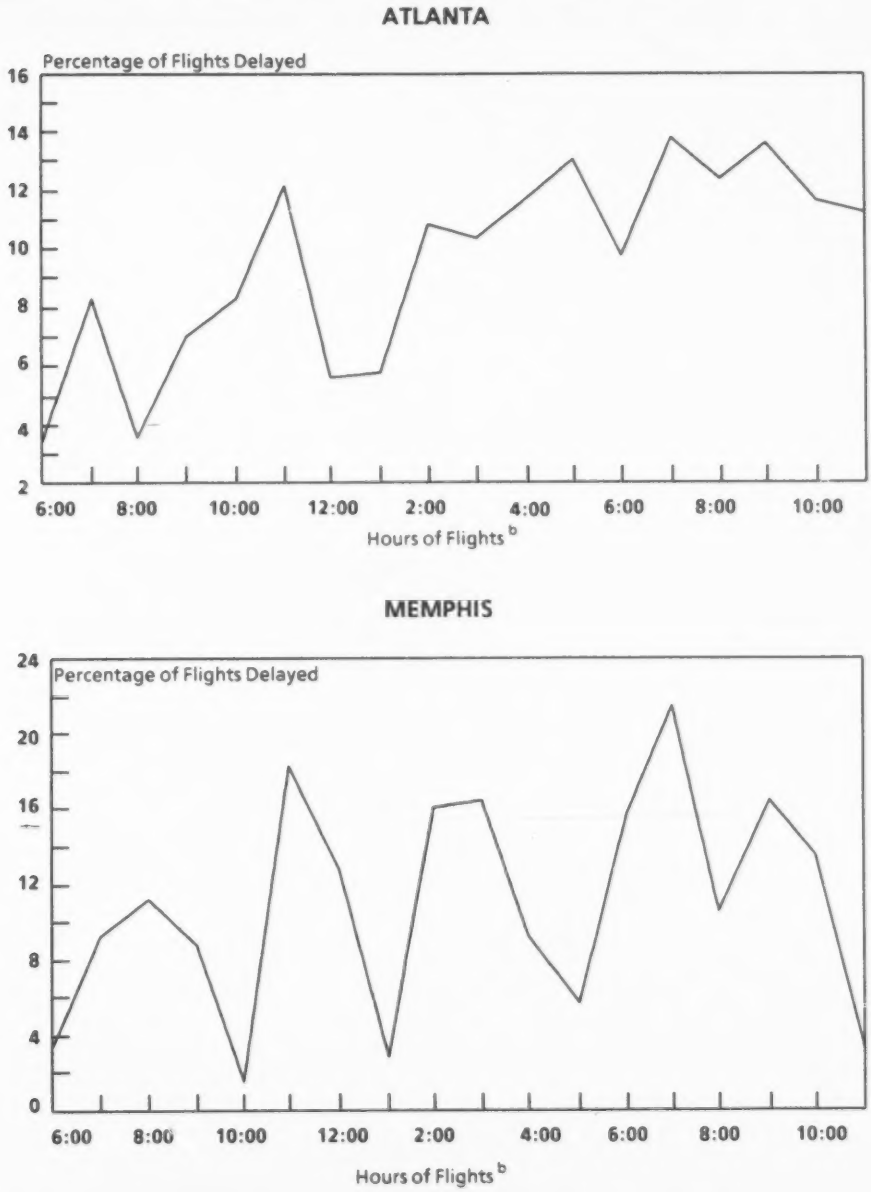
SOURCE: Congressional Budget Office, from Department of Transportation data.

Figure 6. Continued



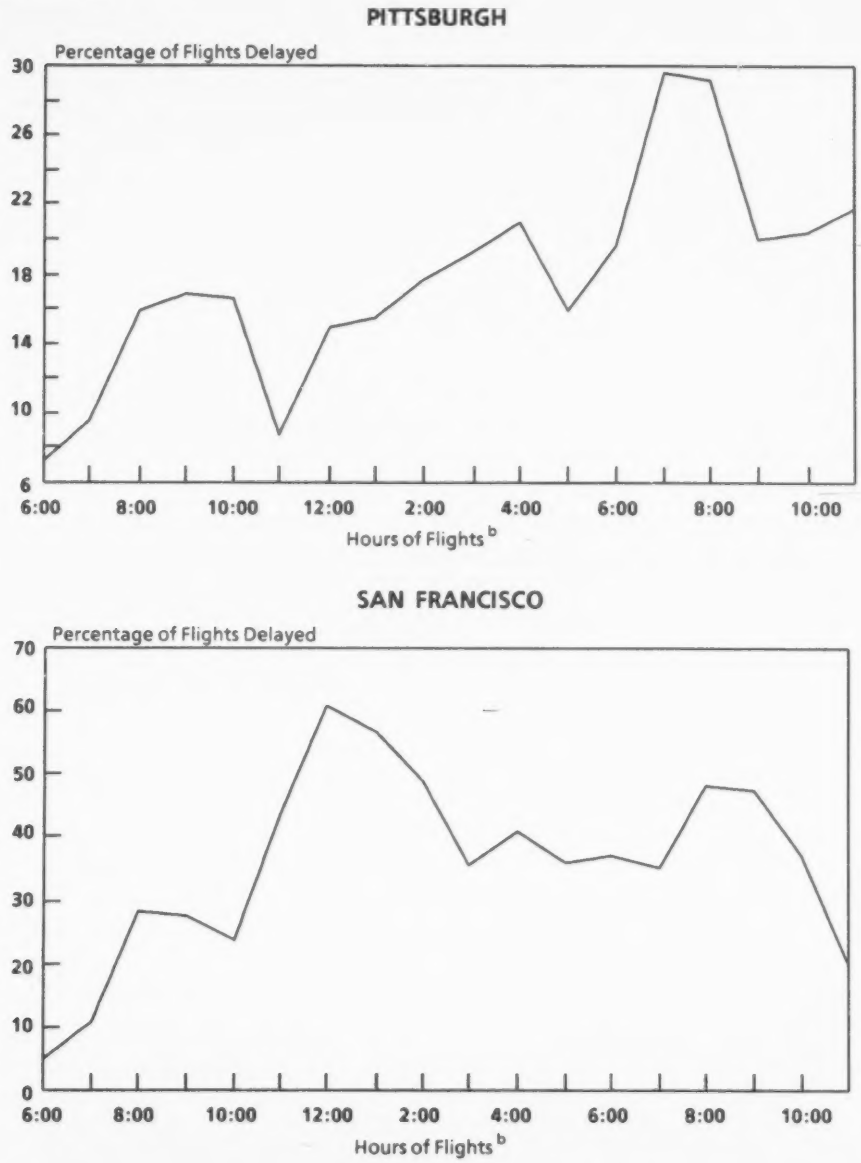
a. Major air carriers are required to report operations, delays and other consumer information to the Department of Transportation.
b. The 11:00 p.m. period includes flights from 11:00 p.m. until 5:59 a.m.

Figure 7.
Flight Delays of 14 Reporting Air Carriers, October 1987 [a]



SOURCE: Congressional Budget Office, from Department of Transportation data.

Figure 7.
Continued



a. Major air carriers required to report operations, delays and other consumer information to the Department of Transportation.
b. The 11:00 p.m. period includes flights from 11:00 p.m. until 5:59 a.m.

capacity in bad weather when airport capacity is most constrained; and reductions in the standards governing simultaneous approaches to parallel runways could also be used to increase capacity. But microwave landing systems raise concerns about capability and cost since they require installing expensive equipment on every airplane, and parallel approaches may entail safety problems. Airlines might respond to delays by substituting larger, wide-bodied aircraft that would permit airports to handle more passengers per flight.10/

MANAGEMENT OF CONGESTION IN THE AVIATION SYSTEM

Congestion in the airport and airway systems results from the interaction of many factors. The combination of fare decreases, hubbing, and sustained economic growth over the last five years has led to increased air travel, while limitations of current air traffic control equipment, physical constraints on airport growth, and long lead times for airport expansion have held back increases in system capacity. So far, congestion has been managed principally through administrative control of air traffic, more intensive use of capacity, and the dissemination of consumer information. Since the prospects for expanding airports are poor, more effective means of handling the congestion need to be found.

Administrative Control. Administrative control has mainly taken the form of slot allocations at airports. Slots are rights to use the air traffic control system to take off or land. Slot restrictions were first instituted at five airports (Washington National, Chicago O'Hare, New York LaGuardia and Kennedy, and Newark International) in 1968 in response to congestion. Controls were soon dropped at Newark, but have remained at the other four airports because of continued concerns about congestion as well as for other reasons such as noise. Slots were allocated among large scheduled aircraft, scheduled commuter aircraft, and general aviation. In each category, slots were allocated

10. For a fuller discussion of operational and technological possibilities for increasing airport and airway capacity, see Office of Technology Assessment, *Airport System Development* (August 1984).

to particular users. 11/ Following the traffic controllers' strike in 1981, slot allocations were extended to an additional 18 major airports for two years. In 1986, the Department of Transportation permitted carriers to buy and sell these slots.

Using slots to limit congestion, even with a resale market, poses problems for competition. It can impede entry to a market. For example, a carrier seeking to offer service between Chicago and New York with four daily round trip flights would need to purchase 16 slots. The times of these slots would have to permit the coordination of arrivals and departures as well as allow the carrier to offer a convenient schedule of flights. Since there are only a few carriers offering slots for sale at any given time, securing the necessary operating rights might be extremely difficult.

A second form of administrative control is the shifting of hub schedules at an airport. The Department of Transportation granted antitrust immunity to airlines, permitting them to coordinate changes in their schedules in order to relieve congestion at peak hours at several airports. Minor changes in the schedules of large numbers of planes can help alleviate delays. Such rescheduling has apparently offered at least temporary relief at Atlanta, Chicago O'Hare, Dallas/Ft. Worth, Newark, and Philadelphia.

Another strategy has been to require the airlines to provide more realistic departure schedules and to publish information regarding average delays on specific flights and in specific markets and also about the on-time performance of carriers. This kind of information may shift demand away from flights and carriers that are chronically late. And such shifts in demand may give airlines an incentive to adjust their schedules accordingly.

While these actions have ameliorated some of the effects of congestion, they certainly have not eliminated it. Moreover, they fail to address the long-run problem of allocating aviation system capacity. There is every reason to believe that the problem of congestion will be-

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11. Initially the airlines met, under antitrust immunity granted by the CAB, to decide the allocation of air carrier slots unanimously among themselves. This system broke down with open entry under deregulation. The Federal Aviation Administration subsequently had to take a more active role in distributing slots. This included taking slots from member carriers and then distributing them by lottery to new entrants and permitting carriers to buy and sell the slots.

come worse as air traffic continues to grow faster than the aviation system. The next chapter looks at options that might be considered in dealing with this problem.

CHAPTER IV

OPTIONS FOR INCREASING COMPETITION AND REDUCING CONGESTION

This study has shown that deregulation has reduced the cost of air travel and increased its convenience. But consolidation within the industry has led to fears that competition may be reduced and some of the benefits of deregulation lost. A more certain threat to those benefits lies in the growing congestion of the airways and airports. Congestion not only causes delays; it may limit entry into new markets, and thus itself reduce competition.

When the Civil Aeronautics Board regulated the industry, it drew upon its own view of fairness and efficiency in shaping the route networks and the fare structure of the airlines. The outcome was a high-cost transportation system that did not respond well to changing needs. Since deregulation, the Federal Aviation Administration has attempted to develop a system that can accommodate all potential users without regard to the additional costs they impose on the system. This policy is at least partly responsible for the current problems of congestion and delay.

Policies to deal with congestion or a lack of competition should be aimed at the source of the perceived problem. To the extent that frequent flyer programs, computer reservation systems, and the prohibition against foreign carriers serving domestic markets limit entry, policies that lessen these barriers may serve to increase competition. Similarly, the most expeditious solution to the problem of congestion might be to make users of the aviation system pay the costs they impose on it.

INCREASING COMPETITION IN THE INDUSTRY

The advocates of deregulation believed that entry of new firms into existing markets, and the threat of entry, would discipline the setting of fares. But developments under deregulation have made entry more

difficult than many envisioned. No one foresaw the important roles that hub-and-spoke route networks, frequent flyer programs, and computer reservation systems would come to play. These developments seem to give large carriers a competitive advantage, and may have helped to precipitate the recent merger wave. The Congress may want to consider policies aimed at lessening these advantages. Some have even maintained that the consolidation warrants a return to some kind of fare regulation. Fare regulation, however, would probably create far more problems than it would solve.

The Issue of Fare Regulation

At present, overall competition within the industry seems still to be reasonably vigorous. Moreover, the industry accommodates a mix of carriers with different cost structures and different market strategies. Reinstating fare regulation would thus be unlikely to add much to the industry's performance. Given the difficulties in regulating fares, the costs would almost certainly be quite large.

There is no simple way to regulate fares. Perhaps the most straightforward method would be to prohibit carriers in each market from charging more than a given price. The Civil Aeronautics Board used such maximum fare regulation in its last years of regulatory authority. But the complex fare structure that has evolved under deregulation would make determining reasonable maximum fares in the various markets a difficult task. Moreover, these maximums might not have much effect since over 90 percent of air travel occurs on some kind of discount fare. To reinstitute fare regulation, therefore, the government would have to undertake detailed investigations of airline costs and passenger demand in order to determine the "correct" level and structure of fares. Forty years of CAB history vividly demonstrated the problems of such a policy.

A less intrusive regulatory approach might attempt to constrain fares by requiring carriers to make all their fares available on a one-way basis. Incumbent carriers have used round-trip fares with advance purchase and minimum stay requirements as a way of meeting competition from new, low-cost carriers. These restrictions have proved to be effective in segmenting the market by distinguishing time-sensitive passengers--most often business travelers--from leisure

passengers. In this way, the incumbents have been able to target their price response to the most price-sensitive passengers, who are generally most likely to use the services of the new entrant.

Requiring carriers to make all fares available on a one-way basis would limit the ability of incumbents to respond as selectively to the lower fares of new entrants. Carriers could continue to charge different fares for different flights, and fares could also vary depending on how long in advance passengers made their reservations, but carriers could not charge different passengers different fares based on their lengths of stay at their destinations. Since many business travelers can purchase tickets well before their departure, and can travel at off-peak times, such a requirement would limit the ability of carriers to target only leisure passengers.

Requiring carriers to offer only one-way fares might raise a number of problems. First, it would eliminate some important benefits that come from airlines' being able to distinguish among passengers: by varying the mix of passengers on their flights, carriers can increase the percentage of seats they fill. This helps airlines provide frequent service, which is especially valuable to time-sensitive passengers. Distinguishing passengers also helps airlines increase the likelihood that time-sensitive passengers can get seats on their preferred flights.1/ In addition, minimum-stay requirements allow carriers to restrict fare cuts to the most price-sensitive passengers, and thus increase the profitability of offering low fares to these passengers. Finally, as with any of the options discussed here, requiring one-way fares might not stimulate much additional entry since a variety of factors apparently limit entry in the deregulated environment.

Frequent Flyer Programs

Frequent flyer programs can also make entry difficult. This is especially the case when a small carrier tries to begin service at an airport where a larger carrier operates a hub. Proposals have been made to ban frequent flyer programs or tax them, although there may be problems with both proposals.

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1. See Robert Frank, "When Are Price Differentials Discriminatory?" *Journal of Policy Analysis and Management* (Winter 1983).

Banning frequent flyer programs would, in the short run at least, be almost certain to increase the effective price of air transportation. Frequent flyer programs are essentially rebates, and carriers compete with one another in the size of their rebates.2/ Accordingly, carriers would have little incentive to translate any savings from ending these programs into price cuts. The reason for establishing frequent flyer programs was to make passengers reluctant to use other airlines, and, since a price cut can be quickly matched, it would do little to increase brand loyalty. Instead, any increased profits generated by ending the frequent flyer program would more likely be dissipated through increases in advertising or in service amenities. To the extent that ending the frequent flyer program stimulated entry, it would encourage increased competition and lower fares.3/

A less drastic step would be to tax travel awards made under frequent flyer programs. People who travel extensively on business tend to be among the most active participants in the programs. Although their employers pay for the transportation, the airlines pay the travel awards--that is, the rebates--directly to the travelers. In effect, the employers are giving the travel awards to the employees; hence the awards should be treated as part of employee compensation and they should be taxed accordingly.

In the case of passengers who accumulate the necessary mileage for free travel while flying for personal reasons, the travel award is not part of employee compensation but simply a price cut. To avoid taxation in this case, people would have to demonstrate that they had personally purchased the air transportation. This could involve significant record-keeping costs. In any case, taxing the travel awards would only reduce, but not eliminate, the advantages that the frequent flyer programs provide larger carriers.

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2. For example, in the beginning of 1988, several major carriers reduced the price of air travel by granting triple miles throughout the year to passengers who flew on those carriers in the first three months of 1988.

3. Still another option would be to allow passengers to transfer their accumulated mileage among themselves. This would lessen the tendency of a passenger to make a commitment to only one carrier's flights. If an active secondary market developed, however, there would be little value to carriers in maintaining frequent flyer programs. See Severin Borenstein, "Hubs and High Fares: Airport Dominance and Market Power in the U.S. Airline Industry," discussion paper, Institute of Public Policy Studies, University of Michigan (March 1988).

Computer Reservation Systems

Like frequent flyer programs, computer reservation systems (CRS) provide distinct marketing advantages to a number of large carriers. Although the systems greatly increase efficiency, airline ownership is not necessary for both airlines and travel agents to benefit from them.

Airlines receive two primary benefits from owning a CRS. An owner can charge high booking fees to other airlines for reservations made on their flights. In addition, a travel agent is apparently more likely to book flights on a particular carrier if the agent uses that airline's CRS. This may stem partly from the ability of CRS owners to use their systems to monitor travel agent behavior and then design commission schedules that are effective in influencing agent recommendations.

One way to prevent carriers from gaining an advantage from computer reservation systems would be to prohibit individual carriers or groups of carriers from owning them. The systems could be owned by nonairline companies or by an industrywide group of airlines. If the government merely prohibited airlines from owning them, nonairline owners would still be able to charge booking fees that exceed costs. If the government mandated an industrywide system, some way would have to be found of combining the existing systems and compensating the current owners. Moreover, forcing divestiture might adversely affect domestic carriers competing in international markets, since foreign carriers would continue to be able to use their systems to influence the behavior of travel agents in their home markets.

An alternative approach would be for the government to regulate the way in which CRS owners and travel agents are compensated. This might eliminate some of the advantages arising from carrier ownership of the systems. At the same time, it would avoid the need for divestiture, and it would not require the government to set booking fees or commission rates.

Booking Fees. The fees that an airline pays a CRS owner are often high because the airlines that pay the fees have virtually no role in determining which CRS an agent uses. One way to increase competition in the establishment of booking fees would be to require travel agents to pay all fees associated with the operation of a computer

reservation system. An agent who had to pay the booking fees would necessarily consider the level of these fees in choosing which CRS to use. Under such a rule, commission rates would almost certainly increase to reflect the agents' higher costs of doing business. Yet the cost to a carrier of accepting a reservation through a travel agent--including the commission and the booking fee--would most likely decline. If the booking fees did not decline or carrier costs did not reflect the lower fees, such a regulatory change would not have accomplished its objective.

Commission Rates. Computer reservation systems provide their owners with information on travel agent booking practices that enables them to tailor their commission rates to individual agents. One way to prevent CRS owners from achieving this advantage would be to require that differences in commission rates paid to travel agents for a given fare on a given flight be justified by differences in costs. There would, however, be no need to require such a justification in the case of differences in commission rates for different fare categories, for different markets, or even for different flights. Such a regulation would be likely to end most commission overrides. To the extent that small carriers must pay commission overrides on a larger percentage of their flights, such a rule would decrease the costs of these carriers relative to their larger rivals.

Even this limited form of commission regulation would present a number of difficulties. Most significantly, it would have to be accompanied by a rule that required carriers to adhere to a price list. If an airline was able to charge different travel agents different fares for the same transportation, it could effectively achieve the same results as if it were permitted unlimited use of commission overrides. Moreover, carriers might be able to circumvent the rule and achieve the same results with different marketing strategies that did not involve overrides. Finally, such a rule might actually constrain competition if it made entry more difficult by preventing carriers from developing special commission packages.

Permitting Foreign Competition

The Federal Aviation Act prohibits foreign carriers from engaging in cabotage--that is, providing domestic air transportation.4/ This prohibition applies even to flights that a foreign carrier already operates between two U.S. cities. For example, Air France operates a flight from Paris to New York that continues on to Washington, D.C. Air France cannot, however, carry domestic passengers traveling between New York and Washington.

The development of hub-and-spoke route systems in domestic markets has been paralleled in international markets as well. Consequently, many foreign carriers would be eager to begin service in U.S. markets in order to provide connecting traffic for their international flights. In most cases, such service would be viable only if the foreign carriers could carry U.S. domestic traffic.

Allowing foreign carriers to provide domestic service would increase competition. It might also enable U.S. carriers to win similar rights in other countries. Currently, such rights are established in bilateral agreements. The United States would permit foreign carriers to operate in domestic markets only if it were able to secure reciprocity from the other countries. One problem is that the United States is much larger than most other nations. Therefore, to secure rights equivalent to a grant of cabotage in this country, it would have to obtain rights to carry traffic between foreign countries.5/

REDUCING CONGESTION

Congestion arises when more aircraft seek to land or take off within a given time period than the aviation system can expeditiously handle. One method used to allocate this excess demand has been delay. But

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4. A carrier is considered foreign-owned if more than 25 percent of the company is owned by other than U.S. citizens. Service between the United States and foreign countries is governed by bilateral air service agreements. With a few exceptions, these agreements limit the routes between the two countries and the number of carriers on each route.

5. For a discussion of this issue, and a review of the recent history of U.S. international aviation policy, see Daniel Kasper, *Deregulation and Globalization: Liberalizing International Trade in Air Services* (Cambridge, Mass.: Ballinger, 1988).

delayed flights have not only brought complaints from airline passengers; they have imposed substantial costs on passengers and airlines alike. Efforts have also been made to reduce congestion through administrative methods, such as rationing takeoff and landing rights or forcing airlines to shift their schedules.

Other ways of reducing congestion would be to expand the peak capacity of the airports or to find better ways of managing the existing capacity. Expanding capacity is relatively expensive, and cannot be done quickly. Better management of the aviation system may offer a faster and cheaper remedy to the congestion problem.

Expanding Peak Capacity

Capacity limitations may occur in three parts of the aviation infrastructure:

- En route traffic control--in the staffing and equipment of air route traffic control centers and flight service stations.
- Airport and terminal traffic control--in equipment and staffing, as well as in approach and landing aids.
- Airports--in the number and configuration of runways and taxiways, including visual landing aids, and in the passenger-processing capability of terminal buildings.

En Route, Terminal, and Airport Tower Traffic Control. En route traffic control causes very little congestion. Despite staffing shortages and equipment problems, capacity generally appears to be sufficient to provide adequate en route services. Moreover, the opening of new air routes often requires only procedural changes and training rather than an investment in capital equipment.

Terminal and airport control tower improvements would reduce congestion by permitting airports to accommodate more arriving and departing flights. At many congested airports, however, a significant expansion of control capacity may have to wait until the FAA completes its modernization of the air traffic control system. This modernization will improve traffic handling rates and streamline control

procedures. Apparently little can be done to speed the process, which is not scheduled for completion until 2000, although major elements will be finished during the 1990s.

Commercial Airports. The major source of congestion is the airports themselves. The expansion of runways, taxiways, landing aids, and terminals could reduce congestion at airports with sufficient control capacity to accommodate increased ground and air capacity. Expansion would not be effective elsewhere until the air traffic control modernization nears completion.

Federal aid could help finance airport expansion. The Congress could, for example, increase the proportion of federal grants to commercial airports for airport development. Thirty percent of federal airport grants currently go to noncommercial airports, although commercial airports are by far the most congested sector of the aviation system. In fact, the increased congestion in recent years has stemmed primarily from the growth in flights by commercial airlines, while noncommercial operations have been falling at an average annual rate of over 3 percent since 1980.6/ Expansion of reliever airports would probably do more to reduce congestion at existing noncommercial airports than at commercial airports.

Redirecting airport grants could provide up to $400 million a year in additional funds to help finance delay-reducing investment at commercial airports. In addition, the unobligated balance in the Airport and Airway Trust Fund could be used to fund projects of $1 billion a year between 1989 and 1993. This combination of funds from both sources would more than double the amount currently spent by the FAA on commercial airport expansion, and would make up a substantial share of the funds the FAA estimates are necessary to reduce airport congestion in the period 1986-1995.

Yet, the possibilities for increasing capacity at congested airports may not be very great, even in the long run. Capacity expansion invariably requires an increase in the number of runways, and at many congested airports it would be virtually impossible to add runways. Some airports, like Washington National and New York's LaGuardia,

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6. For a discussion of trends in general (noncommercial) aviation, see Department of Transportation, *FAA Aviation Forecasts, Fiscal Years 1987-1998*, FAA-APO-87-1 (February 1987).

have no space to build new runways. At others, noise and land-use concerns often provide a formidable obstacle. Even where cities are willing and able to expand their airports, construction will take from three to five years.

In any case, new construction would be a costly solution. Since congestion generally occurs during periods of peak demand, the new facilities would have little use during off-peak periods. Moreover, airlines might be reluctant to build the new terminals that airport expansion would require--especially when such an expansion would permit other airlines to establish competitive services.

Managing Capacity

The current policy of the FAA is to accommodate all potential users of the system, even though in the short term such a policy may result in substantial delays for air travelers. Over a longer period, this policy may require an aviation system that is far larger and more costly than needed. A more efficient and equitable way of managing capacity would be through cost-based pricing.

In a number of instances, congestion has required the government to ration the use of airports. In doing so, it has often made use of take-off and landing rights, or "slots." Since 1968, there have been limits on takeoff and landing rights at four airports--Chicago O'Hare, Washington National, and Kennedy and LaGuardia in New York. For two years following the controllers' strike, flight restrictions were imposed on the 22 busiest airports in order to match demand with the reduced airway capacity. Slots have generally been based on fixed capacity limits reflecting the number of operations during bad weather.

There are a number of problems in using slots to allocate capacity. In the first place, allocation of slots among the various users of the system--jet carriers, commuter airlines, and general aviation--has generally not been very responsive to changes in demand. Perhaps of even greater significance, the use of slots greatly increases the complexities of airline scheduling and the difficulties of entry into new markets. If slots cannot be bought and sold, it is very difficult for a carrier to begin or expand service at one of the slot-constrained airports. Although the FAA currently permits slot sales, the task of

assembling the necessary slots can be formidable for an airline introducing a new service. Frequently there are not enough sellers of slots to permit a carrier to acquire the necessary operating rights. The difficulties in using slots to ration capacity grow exponentially as the number of slot-restricted airports increases.

An alternative system of allocating access at congested airports would be to use the price system. During periods when traffic normally exceeds an airport's capacity, landing fees would be set at levels that would induce some aircraft operators to shift flights to other times or other airports. Such peak-load pricing would provide some indication of the value of expanding capacity. To the extent that airlines were willing to pay higher prices for peak flight times, the extra income could be used by the airports and the FAA to increase capacity. It could also provide some indication of whether, for example, increasing the number of air traffic controllers at a particular airport would be warranted. The fees would be adjusted periodically according to demand and supply conditions. Such fees could be charged in addition to existing aviation taxes or, alternatively, used in place of them.

Peak Surcharges for Air Traffic Control. Increasing the price of flying to a congested airport would decrease the number of flights at the airport. Faced with higher fees, some airlines would find it more profitable to use their equipment on other routes, while noncommercial users might decide to take commercial flights or to travel elsewhere. Increasing the fees by more at certain times than at others would give aircraft flying to the airport an incentive to change their schedules. In these ways, surcharges would reduce delay. Since relatively few commercial airports have a congestion problem--though these handle the majority of airline passengers--a surcharge would cause minimal disruption to aviation financing arrangements. The existing tax structure would not have to be changed. Airlines would pay the surcharge on top of the 8 percent ticket tax that makes up the bulk of the revenues of the Airport and Airways Trust Fund.

Establishing a surcharge, however, would perpetuate the inefficiencies stemming from the fact that existing fees do not reflect the costs of providing the necessary services. Because general aviation aircraft pay less than their costs under existing taxes, they would continue to receive a subsidy during off-peak periods. Moreover, sur-

charges would not correct any underpricing of airport landings and takeoffs during off-peak periods that results from the "residual pricing" method used at 60 percent of commercial airports.

Pricing Air Traffic Control. An alternative approach would be to price air traffic control services so that users would pay the full costs that their flights place on the aviation system. This would replace the existing aviation tax system with a system of true user fees. It would share the advantages of peak surcharges without many of their shortcomings. Prices for air traffic control would consist of two parts: one for en route services, and one for services during landings and takeoffs. FAA's in-flight services are not a major cause of congestion, and hence in-flight charges could be based on per mile or per flight sector fees for the necessary information and guidance.

At congested airports, charges for airport landings and takeoffs would reflect the costs of the controllers and equipment needed to handle the flights, as well as the delays imposed on other flights in the landing or takeoff queues. In other words, during congested periods fees would be established for a given time period so that the number of scheduled departures and arrivals did not result in unacceptable delays. In addition to varying by time of day, airport service charges would also reflect differences in the costs of handling different aircraft. At airports where noise is a concern, landing and takeoff prices could be based on the amount of noise the flights made.7/

As with surcharges, such price variations would tend to encourage a redistribution of traffic between peak and off-peak times and between busy and low-traffic airports. Over the longer term, they would tend to affect airline fleet choices so that airlines used the airway system more efficiently. These prices might also provide some indication of the value of expanding an existing airport or building a new one. Moreover, the pricing system would be a more equitable way of rationing access to existing capacity than current capacity management systems that determine who gets served according to the type of service.

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7. See, for example, David Graham, Daniel Kaplan, and Kathy Sharp, "A Proposal to Adopt Noise and Congestion Fees at Washington National Airport," unpublished paper, Civil Aeronautics Board (January 1981).

A major difficulty would lie in establishing the initial prices. Although FAA has had some experience in estimating the cost of providing its various services, it would be difficult to estimate the demand for landing and takeoff rights at a particular airport at a particular time. Once the prices were established, however, they could be adjusted upward when the number of flights exceeded capacity and adjusted downward when there was excess capacity.

One possible method of establishing initial prices would be to require carriers to bid for landing and takeoff rights at congested airports. The winning bidders would keep the relevant slots for some period of time, say six months. The prices established by those bids would be used to establish the landing fees. Such an auction could be devised so that winning bidders would pay the amount offered by the carrier with the highest losing bid. This procedure would encourage carriers to bid according to their true valuations of a slot; even if a carrier won, it would not have to pay as much as it bid.8/

Using landing fees to allocate capacity would ulimately result in the same number of operations at an airport as if slots were used. The two approaches would produce different results, however, if carriers suddenly wanted to increase service to an airport. If slots were held fixed, an increase in demand would increase their prices. There would not, however, be an increase in operations at the airport.

If the landing fees--that is, the prices of slots--were held fixed, an increase in demand would increase the number of takeoffs and landings. Thus, under a price rationing system there might be periods of congestion. But after landing fees were adjusted to reflect the greater demand, the congestion would disappear. Despite such periods of congestion, a fee system would be more efficient than a slot system because it would allow airlines far more flexibility to enter routes and adjust their schedules.

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8. For a discussion of the use of such an auction to allocate slots, see David Grether, R. Mark Isaac, and Charles Plott, "Alternative Methods of Allocating Airport Slots: Performance and Evaluation," prepared for Civil Aeronautics Board and Federal Aviation Administration, Polinomics Research Laboratories, Inc., Pasadena, 1978. A carrier with counter space and gates at a congested airport might find it necessary to reduce its operations. But there is an active secondary market through which it could sublease its excess facilities.

Another potential difficulty in administering a pricing system is that increases in landing fees would be likely to diminish service at a number of smaller communities. With the low levels of traffic on these routes, carriers might find that they were no longer able to earn an adequate return. To assure service to these routes, it might be necessary to establish special landing fees for such services.9/

9. Charging separate landing fees for different routes might be justifiable on economic grounds. See Severin Borenstein, "On the Efficiency of Competitive Markets for Operating Licenses," *Quarterly Journal of Economics* (May 1988), pp. 357-385. But since many passengers on these thin routes make connections, carriers serving denser routes might help secure the necessary landing rights. See Alfred Kahn, *Economics of Regulation*, Volume II (Santa Barbara: Wiley, 1970), pp. 234, 235.